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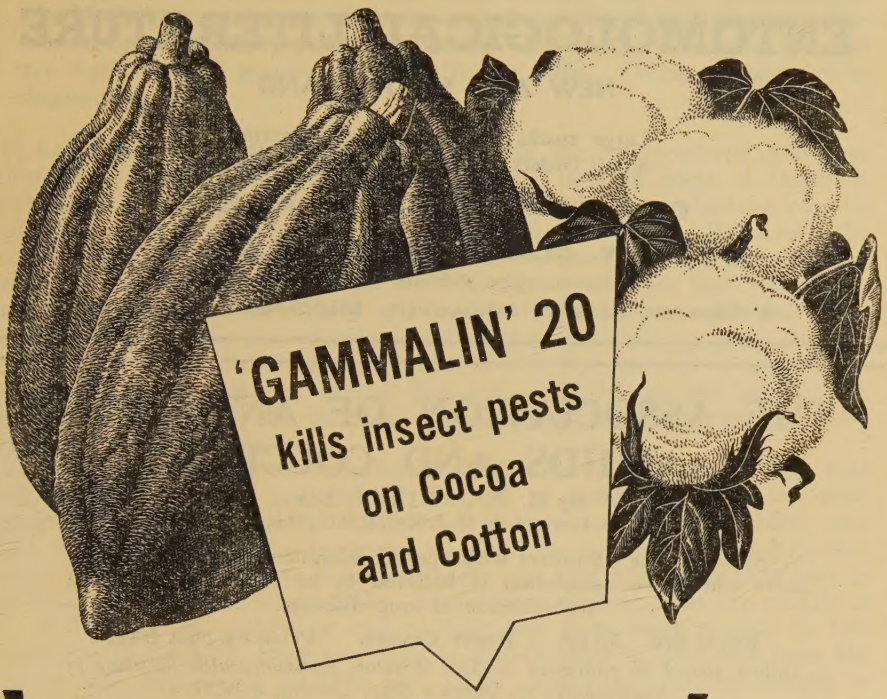

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ISHIKURA (H.). **Seasonal Prevalence of the Appearance of Rice Stem Borer Moth and the Practices of Rice Crop Cultivation. I. Indication of the Modification of seasonal Prevalence accompanied with the Introduction of extraordinarily early Cultivation.**—*Bull. nat. Inst. agric. Sci.* (C) no. 6 pp. 1–10, 2 graphs, 11 refs. Tokyo, 1956. (With a Summary in Japanese.)

It has been shown that the adults of both the overwintered and first generations of *Chilo suppressalis* (Wlk.) appear later in parts of Japan in which rice is transplanted later, and that delayed transplanting can be used as a means of reducing the damage to the crop. However, the successful use of parathion against *C. suppressalis* has made this unnecessary, and attempts have been made in western Japan to begin rice cultivation earlier in the year, in order to avoid damage by typhoons in autumn or to grow two crops during the warmer months. For the latter purpose, the rice should be sown by about the end of March and transplanted in early May. This would favour survival of the first-generation larvae and modify the number and dates of the successive generations, and observations were carried out on these effects.

Light-trap records at an experiment station in Kagoshima showed that adult populations were greatest at the end of June and on about 20th August in 1950–1952. Early cultivation of rice was begun in 1953, and peaks were reached at the beginning of July, in early August and in late August in that year, in late June and early and late August in 1954 and in late June and mid-August in 1955. Adults were present from the middle or end of May to the middle or end of July and from early August to late September in 1950–52, from late May to mid-October in 1953 and from 6th May to late September in 1954 and 1955. Somewhat similar results in Kagawa confirmed that the introduction of earlier cultivation appeared to result in earlier appearance and later disappearance of the moths, in the development of an extra generation and in overlapping of the generations.

When 12°C. [53·6°F.] was taken as the threshold of development, estimates based on the numbers of effective day-degrees during the period of rice cultivation and the number needed for completion of one generation (810 day-degrees C.) indicated that a partial third generation is possible in several places in south-western Japan if rice cultivation begins in early May, but not if it is delayed until June. The calculated dates of maximum adult population, obtained by summation of effective day-degrees after transplanting, are compared with the actual dates, and the effect of early transplanting on insect development, including the occurrence of diapause in the overwintering larvae, is discussed [*cf. R.A.E.*, A **39** 298].

MIYASHITA (K.). **Types of the seasonal Prevalence of Rice Green Caterpillar Moth, *Naranga aenescens* Moore.** [*In Japanese.*]—*Bull. nat. Inst. agric. Sci.* (C) no. 6 pp. 11–16, 6 graphs, 6 refs. Tokyo, 1956. (With a Summary in English.)

The following is based on the author's summary. In studies on the seasonal prevalence of *Naranga aenescens* Moore, which infests rice, light-trap records for 55 localities distributed over the whole of Japan except Hokkaido showed that there were more than four generations a year in the warmer places and two in the colder ones. There appeared to be six types of seasonal development which are described and shown on graphs. Two with 4–6 generations a year occur in Kyushu and Shikoku, and also in the Chugoku and Kinki districts, one with 4–6 generations a year in

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the Kanto and Hokuriku districts, and three with fewer generations in the Tohoku district. The numbers of generations theoretically possible on the basis of temperature in the different regions tended to exceed the numbers actually observed. The number of generations is considered to depend on temperature, and the difference in timing of the 4–6 generations on the distribution of rainfall.

HATAI (N.) & KIMURA (N.). **The Influence of the Size of Spray Particle of DDT Emulsion on the Mortality of Adzuki-bean Weevil.** [*In Japanese.*] —*Bull. nat. Inst. agric. Sci.* (C) no. 6 pp. 17–24, 8 figs., 7 refs. Tokyo, 1956. (With a Summary in English.)

The following is based on the authors' summary. The effect of particle size on the mortality of adults of *Callosobruchus chinensis* (L.) given by DDT sprays was tested by means of a vertical wind tunnel in which an ascending current of air was adjusted so as to keep particles of the required size in suspension, smaller ones moving upwards and larger ones falling down. In 12 tests with four concentrations of DDT in emulsified solutions and with particle sizes of 50–60, 90–110 and 140–160 microns, median lethal doses were obtained, but no definite conclusions were reached, owing to the experimental errors and the difficulty of correction for evaporation in spray particles; it appeared that particle size had little or no influence on mortality.

BRAITHWAITE (B. M.). **An Experiment for the Control of Bean Fly.**—*Agric. Gaz. N.S.W.* **68** pt. 2 pp. 95–97, 1 ref. Sydney, 1957.

A spray of 0·05 per cent. DDT applied to beans [*Phaseolus*] twice within a week of germination and subsequently at weekly intervals until flowering is recommended for the control of *Melanagromyza* (*Agromyza*) *phaseoli* (Coq.) in the central coastal region of New South Wales [*cf. R.A.E.*, A **37** 41]. In April–June 1955, the DDT treatment and a number of other insecticides were tested under the more exacting conditions of the north coastal region, where *M. phaseoli* is the principal pest of beans. The treatments comprised emulsion sprays of 0·05 per cent. DDT, DDD or Chlorobenzilate [ethyl 4,4′-dichlorobenzilate], 0·03 per cent. dieldrin, 0·025 per cent. parathion or 0·02 per cent. diazinon [O,O-diethyl O-2-isopropyl-4-methyl-6-pyrimidinyl phosphorothioate], 0·05 per cent. wettable Chlorparacide [p-chlorobenzyl p-chlorophenyl sulphide], and a dust of 1 per cent. p,p′DDT with 50 per cent. sulphur, and applications were made three days after most of the plants had germinated and subsequently on three occasions at intervals of 3, 7 and 12 days; the last application was delayed by rain. Populations of *M. phaseoli* were high until mid-May, when they were reduced by cold weather. The only materials of value were DDT, DDD, diazinon, dieldrin and parathion, which gave complete or virtually complete protection from infestation. The yields from plots treated with these materials or Chlorparacide were significantly higher than those from untreated plots and plots sprayed with Chlorobenzilate. Light pod infestation by *Maruca testulalis* (Geyer), *Heliothis* [*armigera* (Hb.)] and *Plusia chalcites* (Esp.) caused slight damage on plants treated with dieldrin, parathion or DDT and on untreated ones, and appreciable damage on plants treated with Chlorparacide, Chlorobenzilate or the dust of DDT and sulphur.

BRAITHWAITE (B. M.). **Control of Northern Budworm. Tests of Dieldrin and DDT.**—*Agric. Gaz. N.S.W.* **68** pt. 6 pp. 298, 332. Sydney, 1957.

Heliothis armigera (Hb.) is the most important pest of autumn pea crops in the northern coastal region of New South Wales. DDT has proved highly

effective against the larvae, and comparative tests of emulsion sprays containing DDT at 0·1 per cent. or dieldrin at 0·02–0·05 per cent. were made in 1954. The sprays, each with a wetting agent, were applied on 21st April at 98 gals. per acre, and the living larvae on ten plants in each plot were subsequently counted. All treatments reduced infestation in one day and virtually eliminated it after nine. Populations later increased, but 19 days after application, when the number of living larvae per untreated plot was 22, there were only two larvae in plots sprayed with 0·1 per cent. DDT or 0·05 per cent. dieldrin and six on those treated with 0·04 per cent. dieldrin; in plots sprayed with 0·02 per cent. dieldrin, there were 28.

Lohmeyer (V. K.). **DDT-resistant Codling Moth. Report on 1956–57 Control Trials.**—*J. Dep. Agric. S. Aust.* **61** no. 3 pp. 127–129, 1 graph, 2 refs. Adelaide, 1957.

Previous work on the control of the DDT-resistant strain of the codling moth [*Cydia pomonella* (L.)] on apple at Paracombe, South Australia, showed that organophosphorus insecticides were effective against it, but that frequent applications were necessary, especially where they were not timed by means of bait-trap catches of adults [*cf. R.A.E.*, A **46** 242, etc.]. In further tests in 1956–57, the materials used were malathion at 0·05 per cent. and diazinon [O,O-diethyl O-2-isopropyl-4-methyl-6-pyrimidinyl phosphorothioate] at 0·025 per cent. in wettable-powder sprays and parathion at 0·025 per cent., Dipterex (dimethyl 2,2,2-trichloro-1-hydroxyethylphosphonate) at 0·075 per cent. and AC-528 (2,3-p-dioxandithiol S,S-bis(O,O-diethyl phosphorodithioate)) and Trithion (O,O-diethyl S-p-chlorophenylthiomethyl phosphorodithioate) at 0·03 per cent. in emulsion sprays. Parathion, malathion and diazinon were applied six times between 20th November and 7th March, about six days after the occurrence of moth flights as determined (with some difficulty, owing to the small number of adults taken), by bait-trap catches, Dipterex and malathion 11 times at fortnightly intervals between 31st October and 19th March, and AC-528 and Trithion four times at monthly intervals between 20th November and 20th February. All treatments gave excellent control, the percentages of undamaged fruits, including windfalls, ranging from 93·8 to 98, and there were no significant differences between them. A spray of 0·05 per cent. wettable DDT applied fortnightly resulted in only 60·8 per cent. undamaged fruits. Organic phosphates are toxic to adults of *C. pomonella*, and adult mortality may have contributed to the control afforded by these materials. There was no serious infestation by mites except in the latter part of the season on the plot sprayed with DDT, and no apparent harmful effects to fruits or foliage.

Nair (M. R. G. K.). **A new Pest of Screwpine in Kerala,** *Agonia fuscipes* **Baly (Hispinae, Chrysomelidae).**—*J. Bombay nat. Hist. Soc.* **54** no. 2 pp. 470–474, 1 pl., 2 figs., 5 refs. Bombay, 1957.

Agonia fuscipes (Baly), which has apparently not been previously recorded in India, was observed attacking screwpines (*Pandanus* spp.) throughout the year at Vellayani, in the State of Kerala, southern India. The larvae of this Hispid mine the leaves, on which the adults also cause feeding scars, and either type of damage renders the leaves unsuitable for the manufacture of mats or other articles of commerce. All stages are described. The eggs are laid singly on the lower surfaces of the leaves, usually on the basal half, and hatch in 14–16 days in December–January. The larvae enter the leaves immediately, are active, and pupate within their mines, the larval stage

lasting 71 days in February–May and the pupal stage 14 days in August. The adults, which seldom fly, are found during the day in the axils of the leaves. They feed on both sides of the latter, preferring the distal portion.

GUPTA (V. K.). *Pristomerus testaceacollis* **Cameron—a "nomen nudum" (Insecta: Hymenoptera, Ichneumonidae).**—*Curr. Sci.* **26** pp. 152–153, 3 refs. Bangalore, 1957.

A species of *Pristomerus* that parasitises the larvae of *Holcocera pulverea* (Meyr.), a predator of the lac insect [*Laccifer lacca* (Kerr)], at Namkum, Bihar, was identified as *P. marginicollis* (Cam.) and later as *P. testaceicollis* Cam. [*cf. R.A.E.*, A **21** 131]. A search in the literature revealed no published description of *P. testaceicollis*, which is therefore a *nomen nudum*, and the author was informed by J. F. Perkins that specimens of the Namkum parasite identified as *P. testaceicollis* were specifically distinct from material in the British Museum labelled as the type of that species, which came from Borneo, and also distinct from *P. marginicollis*. Two species of *Pristomerus* have been described from *H. pulverea* attacking *L. lacca* in India, *P. šulci* Mahd. & Kolubajiv [**20** 727] and *P. laccae* Cushm. [**23** 207]. A comparison of Namkum specimens with the type of *P. laccae* revealed no differences beyond those attributable to individual variation, and they also agreed well with the published description of *P. šulci*, of which the type was not available. It is concluded that the Namkum species is *P. šulci*, of which *P. laccae* is a synonym.

LUBATTI (O. F.) & BLACKITH (R. E.). **Fumigation of agricultural Products. XV. Germination and Growth of Cereals fumigated with Methyl Bromide.**—*J. Sci. Fd Agric.* **8** no. 12 pp. 691–697, 9 figs., 8 refs. London, 1957.

The following is based on the authors' summary of this part of a series [*cf. R.A.E.*, A **44** 401]. Seeds of maize, rye and two varieties each of wheat, oats and barley, conditioned to contain about 8, 11, 14 and 17 per cent. moisture, were fumigated with methyl bromide at concentration-time products of 600 and 1,200 mg.-hours per litre over a period of 24 hours at 20°C. [68°F.], and tested for germination immediately after treatment and again after storage at 20° for six months; the damage caused by the fumigant was distinguished from that due to storage at high moisture contents by drying part of each batch of seeds after fumigation and before storage. Barley proved more resistant to methyl bromide than the other cereals, and was the only one to show appreciable germination after fumigation at high dosage and high moisture content. Rye was most and maize least resistant to the effects of damp storage, but damp rye was severely affected by fumigation. No important differences were found in the reactions of different varieties of the same cereal.

CRANHAM (J. E.). **The Action of "early-season" Sprays of Chlorbenside against Fruit Tree Red Spider Mite.**—*J. Sci. Fd Agric.* **8** no. 12 pp. 740–748, 14 refs. London, 1957.

An account is given of further investigations in England [*cf. R.A.E.*, A **42** 67; **45** 235] on the effectiveness of chlorbenside [p-chlorobenzyl p-chlorophenyl sulphide] against *Panonychus* (*Metatetranychus*) *ulmi* (Koch) on apple, when applied just before or during the hatching of the winter eggs. In tests in 1955–56, the greatest reductions in the numbers of mites on the

foliage in June, as compared with no treatment, were 67, 80 and 90 per cent. from sprays containing 0·02 per cent. chlorbenside as a dispersible powder and 0·0125 and 0·05 per cent. in a miscible-oil formulation with xylene as the solvent, respectively. The direct kill of winter eggs was relatively low, and larvae that hatched from treated eggs showed no effects on untreated foliage, whereas almost all those that hatched on treated foliage died.

The growth of the foliage during the hatching period affected the efficiency of the sprays by reducing the deposits per unit area, and mite populations at the end of June were progressively smaller as treatment was delayed from late April to early and late May, but delaying it until immediately after petal-fall, when the adults had developed, resulted in damage to the foliage by the mites. Evidence was obtained that the leaf area increased at very different rates on different varieties of apple between 8th and 29th May, but none that this affected the efficiency of pre-blossom sprays.

When applied in 1955 at 0·02 and 0·05 per cent. in dispersible-powder sprays at the pink-bud stage (10th May), chlorbenside resulted in fewer young mites on 1st June and fewer adults from 1st June to 6th October than did chlorfenson [p-chlorophenyl p-chlorobenzenesulphonate] at the same concentrations [*cf.* **45** 236], and 0·02 per cent. of the former was better than 0·05 per cent. of the latter.

It is concluded that the first application of chlorbenside should be made not later than petal-fall; when the population of winter eggs was small and mite damage unimportant early in the season, an application at petal-fall gave as good and lasting control as one made in mid-June, at the peak of oviposition by the first generation; and when winter eggs were numerous, application at the late pink-bud stage or during flowering effectively prevented early damage by the mites. Since a second application is necessary to ensure control throughout the season, any difference in effectiveness between applications at the pink-bud and petal-fall stages is of little significance.

Novák (K.). **Vliv přirozených nepřátel na průběh přemnožení hřebenule borové** (*Diprion pini* **L.**) **na západním Slovensku.** [Influence of natural Enemies on the Course of an Outbreak of *D. pini* in western Slovakia.] —*Acta Soc. ent. Čsl.* **54** no. 4 pp. 356–362, 1 pl., 39 refs. Prague, 1957. (With a Summary in German.)

An outbreak of *Diprion pini* (L.) that began on pine in western Slovakia in 1949 was controlled by natural enemies, mostly insect parasites. This was rendered possible by the entry into diapause of as many as 85 per cent. of the eonymphs in 1950, which favoured parasites, predators and micro-organisms to such an extent that only 17–19 per cent. of the cocoons escaped attack. The principal parasites were Ichneumonids, of which *Aptesis* (*Microcryptus*) *basizona* (Grav.) was by far the most numerous. In addition, some control was afforded by Tachinids, notably *Sturmia inconspicua* (Mg.) and Chalcidoids, principally *Achrysocharella ruforum* (Krausse). Many of the cocoons were destroyed by small rodents, and almost as many were infected by micro-organisms.

Pospíšil (J.). **K bionomii květilky zelné** (*Chortophila brassicae* **Bouché**). [On the Bionomics of *Hylemyia brassicae*.]—*Folia zool.* **6** pt. 4 pp. 293–300, 2 graphs, 23 refs. Prague, 1957. (With Summaries in Russian & German.)

Hylemyia (*Chortophila*) *brassicae* (Bch.) is an important pest of cruciferous vegetables in Czechoslovakia. The eggs are laid in the soil close to

the stems of the plants and hatch in 4–6 days at 20°C. [68°F.]. The larvae become full-fed in 3–4 weeks; young cabbage or cauliflower plants are destroyed by the feeding of only 1–2 larvae, but older ones survive unless the number exceeds six. Pupation occurs in the soil, among the plant roots, and the pupal stage lasts 1–3 weeks in summer, depending on temperature, the pupae being sensitive to drought. Complete development requires a total of 32–55 days. The newly emerged females require to feed on nectar before ovipositing, which takes place after pairing and a week after emergence. Winter is passed in the pupal stage, and overwintering pupae require exposure to a temperature of less than 0°C. [32°F.] for development. Winter temperatures of 6–22°C. [42·8–71·6°F.] are unfavourable, and temperatures above 25°C. [77°F.] injurious. In general, exposure to a temperature of not more than 10°C. [50°F.] for a period of five months is necessary, and interruption of this period by transfer to higher temperatures is fatal. In Bohemia, in 1952 and 1953, the spring adults emerged in the second half of April and the beginning of May, at a soil temperature of over 10°C. In 1952, three generations were produced; some of the pupae of the third gave rise to adults without overwintering, but these did not survive. The natural enemies observed included *Aleochara bilineata* Gylh. and *Trybliographa* (*Cothonaspis*) *rapae* (Westw.).

Węgorek (W.). **Badania nad biologią i ekologią stonki ziemniaczanej (*Leptinotarsa decemlineata* Say).** [Studies on the Biology and Ecology of *L. decemlineata*.]—*Roczn. Nauk roln.* **74** (A) pt. 2 pp. 135–185, 28 figs., 11 refs. Warsaw, 1957. (With Summaries in Russian & English.)

Leptinotarsa decemlineata (Say) was observed on potato in Poland for the first time near Kielce in 1946 [*cf. R.A.E.*, A **36** 384], having probably been introduced by occupation forces during 1945. Further foci were discovered in the next three years and destroyed, but there was a mass invasion in 1950, after which the beetle spread rapidly across the country. It had reached the eastern frontier near Bialystok by 1954, though the heaviest infestations were still in the western half. This spread is illustrated on maps.

Observations on the bionomics of the beetle were carried out at Szczecin, Poznan and Pszczyna in 1953 and 1954, and the weather conditions encountered are described. It was found that the overwintered adults emerged from the soil in June, before the sprouting of potatoes; this led to dispersal flights in search of food. Oviposition began soon after and continued until mid-August, and its intensity apparently depended on temperature. The maximum number of eggs laid per female in 1953 was 3,096. The egg and larval stages lasted for minima of 8 and 11 days, respectively, under very favourable conditions. The duration of the pupal stage was variable, and first-generation adults emerged one week later in Poznan, two weeks later in Pszczyna and somewhat earlier in Szczecin in 1953 than in 1954. Their fertility was high, the females laying up to 997 eggs each. Development of the second generation was completed at Poznan and Pszczyna in 1953, the first adults emerging on 2nd September, but the adults died before the winter at Pszczyna. Development was not completed at any of the three places in 1954. The autumn population of adults normally belonged to the overwintered, first and second generations, and all entered the soil for hibernation, the first-generation individuals doing so the earliest. This movement seemed to be independent of temperature, and may be influenced by photoperiod. The later it began, the more rapidly it was completed.

As conditions in Poznan permitted the most rapid development of the beetle, the first generation being completed in 36 days, as compared with 48 days in Pszczyna and 56 in Szczecin, it is concluded that the whole of central Poland is likely to prove favourable to it.

Łarczenko (K.). **Odżywianie i diapauza stonki ziemniaczanej.** [Feeding and Diapause of *Leptinotarsa decemlineata*.]—*Roczn. Nauk roln.* **74** (A) pt. 2 pp. 287–314, 7 figs., 2 graphs, 21 refs. Warsaw, 1957. (With Summaries in Russian & English.)

In experiments in Poland, newly emerged adults of *Leptinotarsa decemlineata* (Say) were reared on potato plants of different varieties planted at different times. The leaves of the plants were analysed biochemically, and observations made on the activity of the beetles. It appeared that their physiological condition varied with the composition of the food, and that the diapause resulted from the consumption of food with a high lipoid content, which caused an accumulation of fat in the body and changes in metabolism. Diapause is thus inevitable as the stalks grow old, especially in late summer and autumn. Food with a higher protein content is required for egg maturation.

Węgorek (W.). **Badania nad zimowaniem stonki ziemniaczanej** (*Leptinotarsa decemlineata* **Say) na tle jej fizjologii.** [Studies on the Hibernation of *L. decemlineata* in Connection with its Physiology.]—*Roczn. Nauk roln.* **74** (A) pt. 2 pp. 315–338, 9 graphs, 22 refs. Warsaw, 1957. (With Summaries in Russian & English.)

Observations were made in Poland on the adults of *Leptinotarsa decemlineata* (Say) during the overwintering period. It was found that entry into the soil depended on physiological condition. Females that had not oviposited entered first, followed by the males and then by the females that had oviposited. During the prehibernation period, the fat-content of the beetles increased and their contents of free water and protein nitrogen fell. Mortality occurred mostly in autumn and spring and little during the winter itself. Autumn mortality averaged 56·3 per cent. in females that had oviposited, 22·6 per cent. in those that had not, and 29·1 per cent. in males, and spring mortality in these three groups averaged 66·6, 51·1 and 52·3 per cent., respectively. There appeared to be a direct relation between mortality and free-water content. Emergence from the soil in spring depended not on average soil temperature, but rather on maximum air temperature, the beetles moving to the upper soil layers and awaiting favourable conditions for flight, but lack of soil moisture prolonged the period of hibernation.

Łąkocy (A.). **Badania nad wpływem żywienia larw stonki ziemniaczanej liśćmi różnych odmian ziemniaków sadzonych w różnych terminach na stan fizjologiczny chrząszczy.** [Observations on the Effect on the Physiology of *Leptinotarsa decemlineata* of feeding the Larvae with Leaves of various Potato Varieties planted at various Times.]—*Roczn. Nauk roln.* **74** (A) pt. 2 pp. 339–357, 3 graphs, 6 refs. Warsaw, 1957. (With Summaries in Russian & English.)

In experiments in Poland, larvae of *Leptinotarsa decemlineata* (Say) were reared on potato plants of four varieties planted in April, May or June. The

leaves and the adult beetles obtained were analysed biochemically for water content, dry matter, fat and protein nitrogen, and no differences were found in the beetles that could be attributed to differences in the leaves.

Błońska (A.). **Patogeniczne grzyby stonki ziemniaczanej** (*Leptinotarsa decemlineata* **Say**) **z rodzaju** *Beauveria*. [Fungi of the Genus *Beauveria* pathogenic for *L. decemlineata*.]—*Roczn. Nauk roln.* **74** (A) pt. 2 pp. 359–372, 2 figs., 10 refs. Warsaw, 1957. (With Summaries in Russian & English.)

In experiments in Poland, a culture of *Beauveria bassiana* from Czechoslovakia and one of *Beauveria* sp. from the beetle in Poland both proved pathogenic for *Leptinotarsa decemlineata* (Say). In laboratory and field tests, a dust prepared from the spores gave about 75 per cent. mortality of the larvae, but the adults were more resistant. Methods of obtaining the spores in quantity are described, and it is stated that it is proposed to test the effect of *Beauveria* and chemical insecticides in conjunction.

Bogdanov (V.). **New or rarely found Pests of Sugar-beet in Bulgaria.** [*In Bulgarian.*]—*Bull. Pl. Prot.* **5** no. 1 (8) pp. 84–87. Sofia, 1957.

A list is given of the commoner pests of sugar-beet in Bulgaria, which are *Cleonus punctiventris* (Germ.), *Tanymecus dilaticollis* Gylh., *T. palliatus* (F.),*Psalidium maxillosum* (F.), *Lixus ascanii* (L.), *Otiorhynchus ligustici* (L.), *Gnorimoschema* (*Phthorimaea*) *ocellatella* (Boyd), *Aphis* (*Doralis*) *fabae* Scop., *Chaetocnema concinna* (Marsham), *C. breviuscula* (Fald.), and other flea-beetles, cutworms and wireworms, followed by a list of insects observed on the crop in small numbers or for the first time in 1955.

Krŭstev (V. P.). **A new Pest of Hemp,** *Mordellistena parvula* **Gyll., in Bulgaria.** [*In Bulgarian.*]—*Bull. Pl. Prot.* **5** no. 1 (8) pp. 87–89. Sofia, 1957.

Hemp growing at several places in Bulgaria was severely damaged by larvae of *Mordellistena parvula* (Gylh.) in 1954. This beetle has one generation a year, and the larvae overwinter in the dry stems, giving rise to adults in the latter part of May. Oviposition occurs in early June on the upper parts of the plants, and the larvae bore in the stems, ten or more being commonly observed per plant.

Khristova (E.). *Plutella maculipennis* **Curt. and its Control.** [*In Bulgarian.*]—*Nauchni Trud. Minist. Zemedel.* **1** pp. 239–255, 9 figs., 30 refs. Sofia, 1957. (With Summaries in Russian & English.)

Plutella maculipennis (Curt.) is widely distributed in Bulgaria and attacks cruciferous vegetables of many sorts. The eggs are laid on the leaves and hatch in 9–14, 3–7 and 2–5 days at average temperatures of 13·9, 17·9 and 23·4°C. [57, 64·2 and 74·1°F.], respectively. The larvae feed on the leaves and become full-fed in 40–42 days at 11·4°C. [52·5°F.] and 8–11 days at 24·5°C. [76·1°F.]. Pupation occurs on the plants, and the pupal stage lasts 5–11 days at 17·2°C. [63°F.] and 3–7 days at 23·2°C. [73·8°F.]. The preoviposition period lasts 1–13 days and the oviposition period 1–12, the females laying up to 161 eggs each. During 1954, six generations developed.

Parasitism of the larvae is high, ranging up to 98 per cent., and the parasites responsible are *Angitia armillata* (Grav.) and *Tetrastichus* (*Geniocerus*) *rapo* (Wlk.). Good control is given by spraying or dusting with DDT or dusting with BHC.

Živojinović (S.) & Cvijović (M.). **Mala topolina strižibuba** (*Saperda populnea* **L.). Morfologija—biologija—ekonomski značaj—štetnost—suzbijanje.** [*S. populnea.* Morphology—Biology—Economic Significance—Noxiousness—Control Measures.]—*Mem. Inst. Pl. Prot.* no. 3, 77 [+2] pp., 31 figs., 14 refs. Belgrade, 1956. (With a Summary in English.)

Through force of circumstances, white poplar (*Populus alba*) was widely planted in areas near the rivers Danube, Tisa and Drava, in Yugoslavia, that had previously been used for the same purpose. This led to an outbreak of *Saperda populnea* (L.), which spread throughout the country between 1945 and 1955, causing serious damage in forests. All stages of this Lamiid are described, and a detailed account is given of observations on its bionomics carried out in 1948–55, mainly in Vojvodina. It was found that the adults emerge in early May and are present for about three weeks. The females feed on leaves and bark, but cause little damage, pair with the males, and lay their eggs under the bark of young shoots, in horseshoe-shaped incisions. The eggs hatch in 10–16 days, between about mid-May and 20th June, and the larvae mine in the twigs, hindering the development of the latter and rendering them brittle. The larval stage lasts about ten months, hibernation occurring from October to March, and pupation occurs in late March and April, after a short period of spring activity. Natural enemies afforded little control, but many of the eggs and young larvae were destroyed by the accumulation of callus round the oviposition incisions. Sprays of DDT or BHC gave good kill of adults when applied to infested twigs shortly before emergence was due, the appropriate time being judged by observations on the pupae.

Bollow (H.). **Welcher Schädling ist das ? Vorrats-, Material-, Haus- und Gesundheitsschädlinge.** [What Pest is that ? Pests of Stored Products, Materials, Houses and Hygiene.]—Kosmos-Naturführer, 178 pp., 8 col. pls., text illus. Stuttgart, Franckh'sche Verlagshandl., 1958. Price *DM.* 11·80 cloth; *DM.* 9·80 paper cover.

The information in this book is arranged in the same tabular form as in previous volumes of the series [*R.A.E.*, A **46** 2, etc.], and about two-thirds of it is concerned with household pests in Germany. These are classified as pests of stored foodstuffs; pests of textiles, furs, skins, feathers, paper, etc.; and pests that cause annoyance by their presence on the walls or in the rooms of buildings. As before, the great majority are insects and the information given relates mainly to appearance, type of damage and control.

Franssen (C. J. H.), Wit (S. L.) & van Genderen (H.). **DDT residu's bij de erwtenteelt.** [Residues of DDT in Pea Cultivation.]—*Tijdschr. PlZiekt.* **61** pt. 5 pp. 145–153, 10 refs. Wageningen, 1955. (With a Summary in English.)

DDT sprays are applied to peas in Holland for the control of several insect pests, and investigations were made in 1953–54 on the residues persisting

on the vines before and after ensiling. The following is taken from the authors' summary of the results. Considerable amounts of DDT can be found on the cut vines before ensiling. During ensiling, most, if not all, of the DDT disappears in a relatively short time, both in good silos with a low pH and in bad ones with a high pH, though there was some indication that it disappears more slowly in the latter. Silage from DDT-treated pea crops is not considered likely to contaminate the milk when fed to dairy cows. DDT applied at a rate of 1·8 lb. per acre against *Cydia* (*Enarmonia*) *nigricana* (F.) leaves large residues on the dried vines, and parathion should therefore be substituted on peas to be harvested dry.

de Fluiter (H. J.) & Hubbeling (N.). **Waarnemingen over topvergeling bij erwten.** [Observations on Top Yellows of Peas.]—*Tijdschr. PlZiekt.* **61** pt. 5 pp. 165–175, 2 pls., 19 refs. Wageningen, 1955. (With a Summary in English.)

A virus disease of peas referred to as top yellows occurs in Holland and other countries of western Europe. It infects other leguminous plants, and is transmissible by Aphids, but not by sap inoculation. In experiments, the virus was transmitted by *Macrosiphum* (*Acyrthosiphon*) *pisum* (Harris) from infected peas, lucerne and white clover (*Trifolium repens*) to peas and beans (*Vicia faba*) and from infected to healthy white clover, with feeding periods of a week on the diseased and healthy plants, and by *M. solanifolii* (Ashm.) (*euphorbiae*, auct.) from peas to peas and *V. faba*. In further tests with *M. pisum*, feeding periods of 0·5 or 1 hour on the source of the virus resulted in no infection of healthy peas, whereas high transmission occurred with periods of a day or a week. Lucerne serves as a winter food-plant for *M. pisum*, and is an important source of infection for peas. The best control measure appears to be the use of resistant varieties of peas, of which there are several.

Fransen (J. J.), Kerssen (M. C.) & Bierman-Pauw (E.). **Dampwerking van parathion.** [The Vapour Action of Parathion.]—*Tijdschr. PlZiekt.* **61** pt. 6 pp. 181–187, 3 graphs, 2 refs. Wageningen, 1955. (With a Summary in English.)

The following is based on the authors' summary. Preliminary tests were made on the vapour action of parathion by evaporating parathion residues in closed petri dishes. Adults of *Calandra granaria* (L.) were exposed to the vapour for 24 hours, and protected from contact with the residue by galvanised wire gauze. It was found that the vapour condensed on the gauze, in proportion to exposure time, though not on the covers of the petri dishes. Similar tests in glass jars about 9 ins. high, in which cheese-cloth was substituted for wire gauze, showed that parathion vapour is heavier than air and condensed on the sides and bottom of the jar, and also on the cheese-cloth. In view of these results, small bags of nylon gauze were made. There was little condensation on these, and the behaviour of the insects could be easily observed in them; they were also easy to clean, and the weevils could be fed by placing the bags on coarsely ground grain. Mortalities were plotted against time of exposure, and it was found that 50 per cent. kill was given by exposure to parathion vapour for 10 hours at 30°C. [86°F.], 25 hours at 25°C. [77°F.] and 38 hours at 20°C. [68°F.]. Schrader's finding that 0·35 mg. parathion is contained in 1 cu. metre of air at 30°C. and 0·09 mg. at 20°C. was confirmed by the kills obtained.

Franssen (C. J. H.). **De betekenis van de vroege akkerthrips (*Thrips angusticeps* Uzel) voor het vlas en haar bestrijding in dit gewas.** [The Importance of *T. angusticeps* for Flax and its Control on this Plant.]—*Tijdschr. PlZiekt.* **61** pt. 6 pp. 191–201, 9 refs. Wageningen, 1955. (With a Summary in English.)

The following is based on the author's summary. In Holland, *Thrips angusticeps* Uzel has a brachypterous and a macropterous generation in the year [*cf. R.A.E.*, A **45** 207]. The brachypterous thrips hibernate once or twice in the soil as non-coloured mature insects and emerge in early spring. The macropterous thrips show a pronounced preference for flax and to a less degree for barley and wheat, concentrating on these crops in summer. Fields in which these crops have been grown may thus serve as hibernating places for the brachypterous thrips and remain infected for two years. Attack on young flax by the brachypterous thrips kills the plants if infestation is heavy, or leads to death of the growing tops if it is less severe, but in the latter case the plants ramify and become unsuitable for the production of fibre. The macropterous thrips cause damage of a different sort, the tops standing erect, spots appearing on the leaves, the topmost leaves sometimes falling off, and growth being impaired, so that a shorter plant results. Damage to a full-grown crop is much less. Crop rotation affords the best means of protection, and a suitable one is suggested. Sprays of parathion or dieldrin or a mixture of both, are effective for control [*cf. loc. cit.*].

Baldwin (W. F.) & Riordan (D. F.). **Acclimation Times in *Dahlbominus fuscipennis* (Zett.) (Hymenoptera: Chalcidoidea).**—*Canad. J. Zool.* **34** (1956) no. 6 pp. 565–567, 1 graph, 7 refs. Ottawa [1957].

In this further paper on the effect of heat on survival in females of *Dahlbominus fuscipennis* (Zett.) [*cf. R.A.E.*, A **44** 158], the results are given of experiments in which unfed females, that had been reared, with *Neodiprion lecontei* (Fitch) as the host, at 23°C. [73·4°F.], were exposed not more than 24 hours after emergence first to temperatures of 23, 29, 32 or 36°C. [73·4, 84·2, 89·6 or 96·8°F.] for periods of up to 24 hours and then to a lethal temperature of 43°C. [109·4°F.] for logarithmic intervals of time over the mortality range, after which they were returned to 23°C. and observed for mortality 48 hours later. The period at 43°C. leading to 50 per cent. mortality increased from about 200 to a maximum of 438 minutes after exposure to 36°C. for two hours and to a maximum of 295 after exposure to 32°C. for three hours, but fell to minimal levels after exposure to these temperatures for 18–24 and 12–24 hours, respectively. Resistance was lower in all cases for the other two temperatures, but was again greatest after exposure for 2–3 hours. It is suggested that the increased resistance acquired during the first 2–3 hours of exposure is due to rapid evaporation from the body surface [*cf. loc. cit.*] and that the subsequent decrease occurs when the rate of evaporation exceeds that at which water can be replaced from the body tissues.

Morris (R. F.), Webb (F. E.) & Bennett (C. W.). **A Method of phenological Survey for Use in Forest Insect Studies.**—*Canad. J. Zool.* **34** (1956) no. 6 pp. 533–540, 2 figs., 6 refs. Ottawa [1957].

Miller (C. A.). **A Technique for estimating the Fecundity of natural Populations of the Spruce Budworm.**—*Op. cit.* **35** no. 1 pp. 1–13, 2 graphs, 10 refs. 1957.

These two papers form parts of a series on techniques for the study of natural populations of *Choristoneura fumiferana* (Clem.) in northern New

Brunswick [*cf. R.A.E.*, A **45** 177, etc.], and the following is almost entirely the authors' summary of the first of them. To ensure correct sequence in the timing of insect sampling or control operations over a large forest area it is desirable to know what phenological differences may be expected to occur in it. Measurements of shoot elongation provide a simple and objective method for comparing a large number of phenological stations in one season. By this method, one or more reference stations have to be visited weekly to permit the plotting of growth curves, but the other survey stations have to be visited only twice a year. These visits are made when about 25 per cent. of the cumulative growth at the reference stations is completed and again after growth has ceased. From the data collected, the percentage of cumulative growth completed at the time of the first visit is estimated and by comparison with the growth curve for the reference station the phenological difference in days is obtained. At any one station, the major source of variance in cumulative shoot growth on a given date is between trees, and the optimum allocation of sampling resources will usually be based on the selection, for balsam fir (*Abies balsamea*), of one shoot per tree and ten or more trees per station. The variance is greater for pin cherry (*Prunus pennsylvanica*), which is common in New Brunswick and provides an alternative indicator for years when infestation by *C. fumiferana* is sufficiently severe to destroy the shoots of *A. balsamea*, and larger samples are necessary.

The following is based on the author's summary of the second paper. When infestation of *A. balsamea* is severe, late-instar larvae of *C. fumiferana*, which normally feed on current foliage, may be forced to complete their development on old foliage, which results in a reduction in fecundity [*cf.* **40** 303; **43** 264]. The causes of this reduction are not known, but the factors that may be involved are the amount and the age of the old foliage consumed. The relationship of pupal-case size and fecundity is used as a basis for estimating the expected fecundity in a natural population under these conditions of partial larval starvation, and three regression equations, based on the oviposition records of females reared from pupae of known size collected in plots of *A. balsamea* representing stages in the first five years of severe infestation in north-western New Brunswick, are given. By their means, the fecundity of other populations with a similar infestation history in the same area can be estimated from measurements of the pupal cases. An index of the actual increase of a population is obtained from the ratio of the mean number of eggs to that of pupal cases per 10 sq. ft. of branch surface on the same sample trees in each plot, and such ratios permit comparisons of actual increase between plots and between years on the same plot. Actual and expected egg populations can also be compared, subject to certain limitations, to indicate some aspects of adult dispersal. The mean number of eggs per mass in relation to degree of infestation and a simplified method of counting eggs per mass are also discussed.

Silver (G. T.). **Separation of the Species of Arborvitae Leaf Miners in New Brunswick (Lepidoptera: Yponomeutidae and Gelechiidae).**— *Canad. Ent.* **89** no. 3 pp. 97–107, 26 figs., 6 refs. Ottawa, 1957.

Investigations on the bionomics and control of leaf-miners damaging arborvitae [*Thuja occidentalis*] in New Brunswick were begun in 1950, when the species responsible was thought to be *Argyresthia thuiella* (Pack.). This was found to be accompanied, however, by *A. freyella* Wlsm., a species of the same genus later described as *A. aurcoargentella* Brower, and *Recurvaria thujaëlla* Kearfott, and in this first of a series of two papers, the author

describes the larva, pupa, and adult and the larval mining pattern for each of the four species and the cocoons of *A. aureoargentella* and *A. freyella*.

Reid (R. W.). **The Bark Beetle Complex associated with Lodgepole Pine Slash in Alberta. Part III. Notes on the Biologies of several Predators with special Reference to *Enoclerus sphegeus* Fab. (Coleoptera: Cleridae) and two Species of Mites.**—*Canad. Ent.* **89** no. 3 pp. 111–120, 16 figs., 6 refs. Ottawa, 1957.

In this third part of a series [*cf. R.A.E.*, A **46** 269], notes are given on the predators found associated with broods of *Ips pini* (Say) and *I. perroti* Swaine in the slash of lodgepole pine [*Pinus contorta* var. *latifolia*] in Alberta. The most important was *Enoclerus sphegeus* (F.), for which a redescription of the adult by W. J. Brown and descriptions of the egg and larva are given. Eggs of this Clerid were laid under the bark scales and hatched in 19–22 days in the laboratory. There were four larval instars, of which the first and third each lasted 7–14 and the second up to 35 days. The larvae entered the galleries and fed on the various bark-beetle stages; one reared to maturity in the laboratory consumed 40 larvae, pupae and adults. Species of *Ips* were preferred as food, but large Buprestid and Cerambycid larvae were also eaten in the field and Hymenopterous and Dipterous larvae with reluctance in the laboratory. The fourth-instar larvae left the galleries and overwintered in the litter. In spring, they spun cocoons in which the prepupal and pupal stages, lasting 10–12 and 15–20 days, were passed. The adults remained in the cocoons for up to seven days before emerging, and then preyed on the adult bark-beetles as these were entering the slash. After the latter had entered, they disappeared.

The other important predator was an unidentified mite of the genus *Pediculoides* (*Pygmephorus*), which was present in about 60 per cent. of the slash samples and attacked the eggs of the bark-beetles, destroying up to 33 per cent. of those in galleries examined. The adults were carried into the galleries in spring and summer on the ventral surfaces of the adult bark-beetles, and the females attached themselves to recently laid eggs. They swelled rapidly as eggs matured in them. Some of their eggs were extruded, but most were not released until the body of the mite ruptured. Up to 30 eggs each were produced. The mites hatched within seven days, consumed the bark-beetle egg, and, when fully grown, attached themselves to beetles of the next generation, on which they overwintered and were carried to fresh galleries in the following spring. The newly hatched nymphs of *Pediculoides* were attacked by another mite, *Uropoda fallax* Vitz., which was transported to and from the galleries in the same manner. Mites of this species were too large to pass the plugs closing the egg galleries and preyed on *Pediculoides* only where the plugs were accidentally loosened; they were not observed attacking any stages of the bark-beetles.

White (G. D.) & McGregor (H. E.). **Epidemic Infestations of Wheat by a Dermestid, *Trogoderma glabrum* (Herbst).**—*J. econ. Ent.* **50** no. 4 pp. 382–385, 2 refs. Menasha, Wis., 1957.

Dermestids, though fairly common, were unimportant in stored grain in the United States before 1954, but severe infestations of *Trogoderma glabrum* (Hbst.) [*cf. R.A.E.*, A **46** 262] were found in stored wheat in Kansas in the autumn of that year, and large populations developed in wheat and shelled maize in 1955 and 1956. Collections made in 1955 and 1956 showed that *T. glabrum* was widely distributed in Kansas and also occurred in 12 other

States; *T. inclusum* Lec. appeared to predominate in Oklahoma, particularly in farm-stored grain, *T. parabile* Beal was more numerous than *T. glabrum* in eastern Colorado, and *T. teukton* Beal [*cf. loc. cit.*] was found as far north as Fargo, North Dakota. In metal bins, with a capacity of 3,300 bushels, about 70 per cent. of the examples of *T. glabrum* were in the top two inches of wheat in June–August, 53·7 per cent. in September and 21 per cent. in October, indicating a downward movement with the approach of cooler weather, but hardly any were found more than 5 ft. below the surface; the insects tended to reach a lower level in shelled maize. The concentration of the insects at the surface makes control by fumigation difficult, and of 11 fumigants tested in 1956, only calcium cyanide, liquid hydrogen cyanide and methyl bromide showed promise.

Nielson (M. W.). **Sampling Technique Studies on the Spotted Alfalfa Aphid.**—*J. econ. Ent.* **50** no. 4 pp. 385–389, 2 refs. Menasha, Wis., 1957.

Six sampling techniques were compared in lucerne fields in Arizona to find the most practical and accurate method for estimating populations of the spotted alfalfa Aphid [*Myzocallis maculata* (Buckt.)], here termed *Pterocallidium* sp. They comprised the inverse binomial count, in which 100 subsamples, each consisting of trifoliate leaves selected at random from the upper, middle and lower thirds of the plants until ten infested leaves were found, were taken in each field; the leaf count, in which the Aphids were counted on ten trifoliate leaves selected at random from the upper, middle and lower thirds of the plants, 100 trifoliate leaves per field being examined; counts of the Aphids on 100 stems per field; counts of the Aphids on ten plants per field; counts of the Aphids taken in 100 sweeps of a net; and fork sampling, in which Aphids were shaken from a plant on to adhesive-covered glass slides fixed to the tines of a fork, and the number of Aphids per 100 horizontal square inches of plant cover per field was counted.

Statistical analysis indicated significant differences between field samples for all techniques, but comparison of standard errors and coefficients of variation showed that the first two methods were more accurate and had less variations between samples within replicates and fields than the others. The inverse binomial count was the most accurate, but the leaf-count method was selected as being more practicable. Further studies on the vertical distribution of the Aphid showed that better estimates of the population were obtained from counts on ten leaves selected at random from the middle of the plants or equally from the top, middle and bottom portions than on leaves from the top or bottom only; the second method was selected because of differences in the vertical distribution of alates and apterae. The best combination of sample and sequence was found to be to count the Aphids on three trifoliate leaves, each selected at random from the top, middle and bottom of the plants and to repeat the operation ten times at intervals of 20–50 walking steps taken diagonally across the field.

Gerberg (E. J.) & Goldheim (S. L.). **Weight Loss in stored Corn and Beans caused by Insect Feeding.**—*J. econ. Ent.* **50** no. 4 pp. 391–393, 2 graphs, 1 ref. Menasha, Wis., 1957.

In preliminary investigations in Maryland, kernels of stored maize from which *Sitotroga cerealella* (Ol.) had emerged were found to weigh 10·1 per cent. less than uninfested kernels. Cowpeas infested with *Acanthoscelides obtectus* (Say) in the laboratory showed an average gross loss of weight of

68·7 per cent. after 60 days, and beans similarly infested a loss of 14·7 per cent. with an average of 4·2 insects per bean, or 3·5 per cent. weight loss per insect.

Jaynes (H. A.) & Godwin (P. A.). **Sterilization of the White-pine Weevil with Gamma Radiation.**—*J. econ. Ent.* **50** no. 4 pp. 393–395, 4 refs. Menasha, Wis., 1957.

In preparation for a study of dispersal in *Pissodes strobi* (Peck), in which large numbers of adults were to be released in pine plantations [*cf. R.A.E.*, A **46** 218], several radioactive materials were applied to the insects to determine their sterilising effect. In the test reported, overwintered adults were allowed to feed on pine twigs for five days, and mated and unmated males and females were then exposed to γ-radiation from a radioactive-cobalt source for 76, 152 or 304 seconds, receiving doses of approximately 5,000, 10,000 or 20,000 r, after which irradiated and untreated males were caged with either irradiated or untreated females, previously mated and unmated insects being tested separately, and provided with pine twigs. Examination every three days showed that increasing doses of γ-radiation progressively shortened life, the effect being more marked in males and females that had mated than in those that had not. Irradiation at any of the three dosages halved feeding activity, apparently entirely owing to a reduction in feeding by the females, and treatment of either sex reduced both rate of oviposition and the total of eggs produced, with no consistent difference between doses. The hatching records of the eggs laid indicated that irradiation of either sex normally resulted in complete or almost complete loss of egg viability, except in one unexplained case, and that irradiated males could nullify previous insemination by normal males, though doses above 10,000 r damaged the spermatozoa, so that older sperm could compete successfully and thus reduce the effect of subsequent pairing with sterilised males. In an additional test, normal females that paired with irradiated males and laid non-viable eggs were subsequently paired with normal males, after which viable eggs were laid.

It is concluded that if pairing is repeated as frequently under natural conditions as in the laboratory, the release of sterilised males to reduce the population would not be effective. For sterilising weevils for use in dispersal studies, a dosage of 5,000–10,000 r appeared the best, though the diminished feeding and oviposition rates suggested that other activities, such as frequency of flight, might also be affected.

Walker jr. (J. K.). **A biological Study of** *Collops balteatus* **Lec. and** *Collops vittatus* **(Say).**—*J. econ. Ent.* **50** no. 4 pp. 395–399, 2 figs., 5 refs. Menasha, Wis., 1957.

Adults of *Collops balteatus* Lec. and *C. vittatus* (Say), the immature stages of which are described, occur throughout the year in Texas and are common in fields and gardens, but little is known of the life-history of these Malachiids or of their importance as predators [*cf. R.A.E.*, A **33** 106]. Laboratory tests were therefore made in 1953–55 and supplemented by field observations.

In the laboratory, the larvae fed on the pupae, eggs and freshly killed adults of all the insect species provided, and the adults readily devoured Aphids and the eggs of *Platyedra* (*Pectinophora*) *gossypiella* (Saund.) and *Acontia dacia* Druce, dead Coccinellids and *Collops* and parts of dead moths and grasshoppers. The larvae of both species moulted four or five times, and the corresponding larval stages in *C. balteatus* and (in brackets) *C.*

vittatus averaged about 45 (113) and 62 (57) days and the life-cycles from egg to egg 83 (59) and 98 (72) days, respectively; the egg and pupal stages lasted about 8 and 7 days for *C. balteatus* and 9 and 6 for *C. vittatus*, and the females deposited averages of 574 eggs in 63 days and 580 in 41 days. There appeared to be about 3–4 and 5–6 generations a year, respectively.

C. vittatus was the more abundant in the field. Both species were most numerous and most effective as predators in the autumn, but they oviposited throughout the year, the eggs being deposited and the larvae developing in dry plant material on the soil surface.

Fukuto (T. R.), Wolf III (J. P.), Metcalf (R. L.) & March (R. B.). **Identification of the Sulfone Plant Metabolite of the Thiono Isomer of Systox.**—*J. econ. Ent.* **50** no. 4 pp. 399–401, 2 figs., 4 refs. Menasha, Wis., 1957.

In this sixth paper of a series [*cf. R.A.E.*, A **45** 181], experiments are described on the metabolism of O,O-diethyl O-2-(ethylthio)ethyl phosphorothioate [demeton-O], one of the two isomers present in Systox [*cf.* **44** 230], in cotton plants. Demeton-O prepared with ^{32}P was applied to the bases of young plants, and leaves were picked after ten days and treated by methods that are described to recover and isolate the metabolites. One of these was found by examination of its infra-red spectrum to be identical with O,O-diethyl O-2-(ethylsulphonyl)ethyl phosphorothioate (the thionophosphate sulphone), which is therefore shown to be a metabolite of demeton-O. It is a secondary one, since the first step in the metabolism of demeton-O in plants has been found to be conversion to the sulphoxide, O,O-diethyl O-2-(ethylsulphinyl)-ethyl phosphorothioate [*cf.* **44** 231].

Madsen (H. F.) & Hoyt (S. C.). **The Effects of Spray Chemicals on local Dispersal of Woolly Apple Aphid.**—*J. econ. Ent.* **50** no. 4 pp. 402–406, 5 figs., 4 refs. Menasha, Wis., 1957.

Control of *Eriosoma lanigerum* (Hsm.) on apple in California is complicated by movement of the Aphids between the aerial parts and the roots and, on the Yellow Newtown Pippin variety, by infestation of the cores of mature fruits. Tests were made in 1955–56 of the use of sprays, and records of Aphid dispersal were obtained from bands of aluminium foil, bearing a layer of adhesive and fastened round the trunks of the Newtown variety to trap the moving insects. Spray quantities given are per 100 U.S. gals.

In 1955, sprays were applied at 350 U.S. gals. per acre at monthly intervals from petal-fall, and treatment with 1 U.S. quart emulsion concentrate containing 42 per cent. Am. Cyanamid 12008 [O,O-diethyl S-isopropylthiomethyl phosphorodithioate], 42 per cent. Thimet [O,O-diethyl S-ethylthiomethyl phosphorodithioate] or 25 per cent. diazinon [O,O-diethyl O-2-isopropyl-4-methyl-6-pyrimidinyl phosphorothioate] reduced Aphid movement in either direction to a very low level and prevented core infestation; 1 U.S. pint 50 per cent. Trithion [O,O-diethyl S-p-chlorophenylthiomethyl phosphorodithioate] and 1 lb. 50 per cent. wettable Guthion [O,O-dimethyl S-(4-oxo-benzotriazino-3-methyl) phosphorodithioate] were also effective, the latter preventing upward more than downward dispersal, but 6 lb. wettable ryania did not give commercial control.

In 1956, 1 U.S. quart 48 per cent. Thimet and 2 lb. 25 per cent. wettable diazinon reduced Aphid movement to a low level and prevented core infestation when applied five times at intervals of four weeks or three times at intervals of eight weeks, and 1 U.S. pint 50 per cent. Trithion was satisfactory at four-week intervals. Malathion at 1 U.S. pint 57 per cent.

emulsion concentrate was applied in May and June and then in July, August or September, and proved less effective than the other materials; August appeared to be the critical time for obtaining control and preventing core infestation in 1956.

Infestation of the cores was found to be closely associated with high populations; it occurred late in the season, when Aphids were most numerous and there were most apples with open calyces, and was prevented by suitably timed sprays. Materials that prevented upward movement of the Aphids as well as controlling them in the aerial parts of the tree were found to give better long-term control than those that gave a high initial kill but had little residual effect.

Taschenberg (E. F.). **Evaluation of organic Phosphorus Insecticides for Grape Leafhopper Control.**—*J. econ. Ent.* **50** no. 4 pp. 411–414, 1 graph, 9 refs. Menasha, Wis., 1957.

In 1953–55, experiments were carried out on the control of *Erythroneura comes* (Say) on vines in New York. Sprays were applied once with a hooded boom, at 200 U.S. gals. per acre before bloom against the overwintered adults or at 250 U.S. gals. after it against nymphs and summer adults. The insecticides were used as wettable powders or emulsion concentrates, alone in 1953 and with a fungicide mixture including 4 lb. lime per 100 U.S. gals. in 1954 and 1955; 0·25 per cent. emulsifiable oil was added to all wettable-powder sprays.

DDT was very effective, showing that the Cicadellid had developed no resistance to this compound [*cf. R.A.E.*, A **43** 40]. Single applications of 1 lb. 75 per cent. wettable powder per 100 U.S. gals. before or of 0·5–1 lb. 50–75 per cent. wettable powder after flowering gave adequate control throughout the growing season. Demeton [diethyl 2(ethylthio)ethyl phosphorothioate] gave comparable control at 12 fl. oz. 50 per cent. concentrate in pre-bloom sprays and at 4 fl. oz. 50 per cent. concentrate or 8–16 fl. oz. 26 per cent. concentrate in post-bloom sprays. A post-bloom application of 2 lb. 50 per cent. wettable methoxy-DDT (methoxychlor) was effective for at least 21 days in a single test in 1953, whereas Strobane [a chlorinated mixture of α-pinene isomers with a chlorine content of about 66 per cent.], parathion, EPN [O-ethyl O-p-nitrophenyl phenylphosphonothioate] and diazinon [O,O-diethyl O-2-isopropyl-4-methyl-6-pyrimidinyl phosphorothioate] in wettable powders and Metacide [methyl-parathion and parathion] in a concentrate gave good kills for 4–5 days but had little further effect. Wettable malathion gave good initial control when used alone, but was much less effective when lime was added, and wettable Chlorthion [O,O-dimethyl O-3-chloro-4-nitrophenyl phosphorothioate] and Guthion [O,O-dimethyl S-(4-oxo-benzotriazino-3-methyl) phosphorodithioate] were relatively ineffective.

Applications of 6 oz. demeton per acre in sprays on 2nd and 16th August resulted in residues below the tolerance of 1·25 parts per million in the grapes on 6th September, whereas similar applications of 12 oz. per acre gave residues exceeding it, except when lime was added.

Stephens (S. G.). **Sources of Resistance of Cotton Strains to the Boll Weevil and their possible Utilization.**—*J. econ. Ent.* **50** no. 4 pp. 415–418, 29 refs. Menasha, Wis., 1957.

Since *Anthonomus grandis* Boh. develops on few plants other than cotton in the United States [*cf. R.A.E.*, A **46** 62, etc.], the breeding of varieties

resistant to it might afford a useful means of reducing crop losses. There seems clear evidence that the weevil shows preferences in its reactions to the cultivated species of cotton and also to certain morphological and physiological variants that occur as mutants within the Upland group of *Gossypium hirsutum*; these include red plant colour [*cf.* **16** 674], hairiness, and absence of stem glands, are genetically simple to manipulate and indicate which plant characteristics are important to the weevil. Owing to existing lack of knowledge of the nature of the resistance mechanism, only a few of the plants in any segregating progeny are likely to possess a combination of genes conferring an appreciable degree of resistance, but if resistance could be associated with specific plant characteristics, it would be possible to select first for the associated character and then to test the selections for resistance in bulk. Attempts were therefore begun in North Carolina to evaluate and measure preferences associated with specific plant characterictics [*cf.* next abstract], to study the effect of the composition of a plant population on the degree of preference expressed and to investigate the possibility of increasing resistance by combining different sources.

WANNAMAKER (W. K.). **The Effect of Plant Hairiness of Cotton Strains on Boll Weevil Attack.**—*J. econ. Ent.* **50** no. 4 pp. 418–423, 2 graphs, 8 refs. Menasha, Wis., 1957.

In an attempt to evaluate the effect on infestation of cotton by the boll weevil [*Anthonomus grandis* Boh.] of the type and distribution of the epidermal hairs on the plant [*cf.* preceding abstract], collections were made in North Carolina of the Upland cottons (*Gossypium hirsutum*) of all the available hairy types, including varieties carrying the genes H_1 and H_2, which have been shown to be the two mainly controlling the amount, type and distribution of hairs in New World cottons. F_1 hybrids were obtained between the variety Pilose and other hairy types, and the parental types and F_1 hybrids were grown in a randomised block in the spring of 1955. The experimental field was artificially infested with *A. grandis*, and it was found that the varieties MU-8 and Pilose, which carried the genes H_1 and H_2, respectively, in a homozygous condition, received significantly less damage, as measured by feeding and oviposition punctures, than the other types. Since both carry intensifying genes for hairiness in addition to the major factors, resistance is probably due to the presence of H_1 or H_2, supplemented by unknown intensifiers. The resistance observed was not by itself sufficient for practical use. Differences in the position and characteristics of the hairs are discussed in relation to their possible importance in resistance to the weevil. MU-8 has hairs of moderate density on the upper parts of the bud and upper, inner surfaces of the bracts, whereas Pilose has dense hairs over all the flower parts. On other parts of the plant, MU-8 has long and dense hairs, and Pilose very dense but short hairs.

WHITE (R. T.). **Studies on the Storage and Shipment of whole Black Pepper grown in the Orient.**—*J. econ. Ent.* **50** no. 4 pp. 423–428, 2 graphs. Menasha, Wis., 1957.

Shipments of whole black pepper [*Piper nigrum*] imported into the United States from India and other eastern countries are sometimes contaminated with insects or moulds and have to be cleaned before being released for sale; investigations on insect infestations and their possible relation to mould growth were therefore made.

It was found that although storage conditions were satisfactory on most cargo ships, almost all the pepper unloaded at New York contained some living or dead insects and mites, and living or dead moulds, principally of the genus *Aspergillus*. Most of the insects were also present in pepper specially despatched from India in sealed containers. Psocids, mites and some species of stored-product insects bred readily in pepper with a moisture content above 13 per cent., and such pepper was also subject to excessive growth of moulds. It was shown that the washing and cleaning process in use in all pepper-growing areas in the east would remove most of the surface moulds, insects and foreign material prior to shipment, and that whole pepper could easily be dried in the sun to a moisture content of 10 per cent. or less. Insects and moulds did not develop in pepper that did not contain more than 11 per cent. moisture and was stored in sealed containers. Pepper stored in bulk or in burlap bags tended to reach an equilibrium moisture content, governed by the humidity of the atmosphere, and pepper dried to an initial moisture content of 11·5 per cent. and free of surface moulds showed no increase in moisture and remained free from moulds and insects when stored at 70 per cent. relative humidity.

In tests, a dust of pyrethrins and piperonyl butoxide (1:10) mixed with the pepper (1:600) or applied to the bags at a rate of 10 mg. pyrethrins per sq. ft. failed to protect the pepper from infestation on the voyage from India; some infestation had occurred before treatment, and high moisture content and mould growth interfered with the action of the dust. Heavy applications of sorbic acid as a dust to both pepper and container failed to prevent the growth of moulds on pepper stored in burlap bags at high relative humidities. Laboratory and practical tests showed that polyethylene films are sufficiently moisture-resistant to be used as linings for double burlap bags, even under monsoon conditions, and it is recommended that pepper, dried to less than 11 per cent. moisture content and freed from moulds and insects, should be forwarded in such bags with linings of polyethylene, preferably 0·003 inch or more in thickness. The linings should be slightly larger than the bags, and should be tied with strong cord and retied after the ends have been folded over. The bags should be sewn up and handled with caution to avoid injury to the linings.

Weidhaas (D. E.). **Adsorption of DDT, Methoxychlor and some related Compounds on Insecticide Dust Diluents and Carriers.**—*J. econ. Ent.* **50** no. 4 pp. 429–435, 2 graphs, 9 refs. Menasha, Wis., 1957.

The following is based on the author's summary. Experiments were carried out to study the adsorption of DDT, DDE (1,1-bis(p-chlorophenyl)-2,2-dichloroethylene), methoxy-DDT (methoxychlor), methoxy-DDE (1,1-bis(p-methoxyphenyl)-2,2-dichloroethylene) and DDA (bis(p-chlorophenyl)-acetic acid) on the surfaces of some or all of five typical commercial diluents used in insecticidal dusts; these comprised a montmorillonite, an attapulgite, a kaolinite, a diatomaceous earth and a pyrophyllite. Solutions of known concentrations in organic solvents were prepared, and weighed amounts of the diluents were added; the resulting suspensions were shaken and allowed to come to equilibrium, and the amount adsorbed was calculated from the difference between the initial and final concentrations.

The amount of adsorption varied with the nature and extent of the surface areas of the diluents and with the structure of the adsorbed compound, and was least on pyrophyllite in tests with the first three chemicals and greatest on attapulgite in tests with all of them. Reactions of methoxy-DDT and methoxy-DDE, involving colour development and catalytic changes, were observed on the surfaces of the first three diluents; comparisons of the

amount of reaction on the different diluents indicated that it was correlated with the presence of acid sites on their surfaces.

Wallis (R. L.). **Seasonal Abundance and Host Plants of the Tuber Flea Beetle in the Rocky Mountain Region.**—*J. econ. Ent.* **50** no. 4 pp. 435–438, 6 refs. Menasha, Wis., 1957.

The observations described, on the seasonal abundance and food-plants of *Epitrix tuberis* Gentner in the Rocky Mountain region of the United States, were made in 1945–54. Damage by the larvae to potato tubers is a serious problem in western Nebraska, eastern Wyoming and northern Colorado; leaf-feeding by the adults is less important. The information is based on adult populations, as determined by sweeps made every 1–2 weeks.

In some years, the adults began emerging from hibernation in the first week of May and the peaks of population of this and later generations occurred about 24th June, 19th August and 23rd September. Feeding occurred on non-economic plants and potato shoots in cull piles until cultivated plants were available. In the irrigated area of North Platte Valley, there were about twice as many adults on the small early crop of potatoes as on the medium crop and about ten times as many as on the late crop, but there were about ten times as many on the late crop as on the early one in northern Colorado. Populations were very small in the dry-farming areas in Banner County, Nebraska, and Laramie County, Wyoming, apparently owing to the shorter growing season, the absence of cull piles and the dry soil, which does not favour the survival of the larvae. On tomatos in the North Platte Valley and northern Colorado, *E. tuberis* occurred principally in the early and late parts of the growing season, and the main injury was to the leaves soon after the plants were set in the field. Matrimony vine (*Lycium* spp.) proved an important source of infestation for cultivated crops, because of its early growth; buffalo-bur (*Solanum rostratum*) and ground-cherry (*Physalis* spp.) attracted few adults and did not begin growth before potatoes were available. The populations of *E. tuberis* found by sweeping on these plants in each of the ten years are shown in a table.

Yushima (T.). **Changes in Rate of Synthesis of Acetylcholine *in vitro* in Eggs of the Asiatic Rice Borer, *Chilo suppressalis* (Wlk.), and the Cabbage Armyworm, *Mamestra brassicae* (L.), during embryonic Development.**—*J. econ. Ent.* **50** no. 4 pp. 440–443, 2 graphs, 18 refs. Menasha, Wis., 1957.

The following is based on the author's summary. An account is given of the changes in rate of synthesis of acetylcholine (ACh) *in vitro* in extracts of the eggs of *Chilo suppressalis* (Wlk.) and *Mamestra brassicae* (L.) during embryonic development. The optimum pH for the synthetic reaction was 6·6–7·2. Synthetic activity was first observed when the neuroblast became differentiated, 24 hours after oviposition, and it increased rapidly up to the stage of blastokinesis and gradually thereafter, until the eggs hatched. The maximum value was found to be 600 and 500 μg. per g. egg preparation per hour, just before hatching, in *C. suppressalis* and *M. brassicae*, respectively. The first appearance of ACh synthesis *in vitro* agreed exactly with that of an ACh-like substance *in vivo*, suggesting that the latter is ACh itself.

ACh decomposition began 80 and 60 hours after oviposition and increased until hatching, and this lag is a major factor causing accumulation of a considerable amount of the ACh-like substance in the eggs at some stages of embryonic development.

Dahms (R. G.) & Wood jr. (E. A.). **Evaluation of Greenbug Damage to Small Grains.**—*J. econ. Ent.* **50** no. 4 pp. 443–446, 3 refs. Menasha, Wis., 1957.

During tests of insecticides for the control of *Toxoptera graminum* (Rond.) on cereals in Oklahoma in 1951–54, the degree of injury caused by the Aphid was measured. It harms the plants in various ways [*cf. R.A.E.*, A **18** 162; **40** 304], and even light infestations may cause measurable reductions in yield.

Populations of different densities were produced on the plants by partly controlling existing infestations with insecticides or by manually infesting the plants with greenhouse-reared insects. On wheat, an average population of 100 Aphids per foot of plant row (sown with a seven-inch drill) reduced the yield per acre by 2·1–4·6 lb. grain per day, whether infestation occurred in February, March or April, and plant variety and soil fertility appeared to have little effect on the loss. Damage was least when sprays were applied early; Metacide [methyl-parathion and parathion] was the most effective, parathion and demeton [diethyl 2-(ethylthio)ethyl phosphorothioate] gave satisfactory control, malathion was effective in one field but not in another, and schradan was unsatisfactory.

Three varieties of oats showed marked differences in yield reaction. One suffered slight injury from an infestation of short duration but marked reductions in yield from an extended one, and another a considerable reduction from a light infestation of short duration; the third was very attractive to the Aphids and had a higher infestation, but recovered very well if control measures were applied early enough. Treating the seed with a dust of 50 per cent. demeton on activated charcoal, or with a slurry prepared from the dust and 4 per cent. methyl cellulose in water, prevented injury for 40 days or more.

Light infestations caused marked reductions in yield of two varieties of barley, populations averaging one Aphid per foot of row reducing it by more than 0·5 lb. per acre per day.

Bowling (C. C.). **Seed Treatment for Control of the Rice Water Weevil.** —*J. econ. Ent.* **50** no. 4 pp. 450–452, 2 refs. Menasha, Wis., 1957.

Lissorhoptrus oryzophilus Kuschel is a pest of rice throughout the southern United States, and experiments on its control by treating the seed with insecticide before sowing were carried out in Texas in 1956. When creamy suspensions of wettable powders were mixed thoroughly with the seed, lindane [almost pure γ BHC], aldrin and dieldrin gave about 90 per cent. or more reduction in numbers of larvae at the rate of 8 oz. toxicant per 80 lb. seed, in two greenhouse tests, in which the plants were exposed to adults when three weeks old, and also at 4–8 oz. per 100 lb. in a small-plot test; no significant increases in yield resulted. Dieldrin at about 1 oz. per 100 lb. seed gave good protection against a light infestation in a large field test. Thimet [O,O-diethyl S-ethylthiomethyl phosphorodithioate] applied on a charcoal carrier gave over 50 per cent. reduction in the greenhouse tests, but was ineffective in the field; wettable DDT and methoxy-DDT (methoxychlor) gave 30–40 per cent. reduction in the greenhouse, and demeton [diethyl 2-(ethylthio)ethyl phosphorothioate], in an emulsifiable concentrate, practically none. Lindane and Thimet retarded emergence and growth of the seedlings in the greenhouse, but no phytotoxicity was observed in the field.

The mode of action of seed treatment in controlling *L. oryzophilus* is not known, but it did not apparently kill the adults or reduce feeding or oviposition by them; it has the advantage over other methods [*cf. R.A.E.*, A

43 245–246] of low cost and ease of application. Suitable insecticides can be combined with fungicides and applied at any time, and so could be used to protect the rice seed from insects during storage.

Phillips (G. L.) & Nelson (H. D.). **Permeability to Methyl Bromide of Plastic Films and Plastic- and Rubber-coated Fabrics.**—*J. econ. Ent.* **50** no. 4 pp. 452–454, 1 fig., 2 refs. Menasha, Wis., 1957.

The permeability to methyl bromide of 25 new fabrics available for use as gas-proof sheets during fumigation was tested by measuring the amounts of gas that escaped through them from a fumigation chamber. A dosage of 4 lb. volatilised methyl bromide per 1,000 cu. ft. was used, and air samples were taken from the chamber at intervals for up to 18 hours, after which time the loss of methyl bromide ranged from 6·5 to 63·1 per cent. Polyethylene and vinyl films and synthetic rubbers, or materials coated with them, were the most effective in retaining the gas, and accidental contact of the films or coatings with liquid methyl bromide was not injurious unless the sheet was under stress. Although the film materials do not withstand so much handling or rough usage as the coated fabrics, both will probably be useful. Permeability varied for the three polyethylene and three vinyl films tested, both permeability and chemical resistance depending on the process of manufacture. Some minor differences may have been due to defects in the samples tested, and consideration should, therefore, be given to each product rather than to the general type of material.

Cox (J. A.). **The Effectiveness of several Insecticides and various Spray Programs for the Control of Grape Berry Moth.**—*J. econ. Ent.* **50** no. 4 pp. 455–457, 4 refs. Menasha, Wis., 1957.

In view of the excessive residues left on grapes at harvest when DDT is applied three times, soon after the berries set, ten days later and again in early August, for the control of *Paralobesia viteana* (Clem.) [*cf. R.A.E.*, A **38** 246], other insecticides were compared with it in field tests in Pennsylvania in 1952–56. Spray quantities are given per 100 U.S. gals. Dilute sprays were applied at 200–300 U.S. gals. and concentrated sprays at 50–75 U.S. gals. per acre.

In 1956, three applications of 12 oz. wettable DDT in dilute sprays or of 3 lb. wettable DDT in concentrated ones gave 96 per cent. or more control of a heavy infestation, as measured by counts of infested berries, and split schedules of DDT in the first two applications and of parathion, EPN [O-ethyl O-p-nitrophenyl phenylphosphonothioate] or methoxy-DDT (methoxychlor) in the third gave comparable results, with lower residues at harvest.

Parathion and EPN were tested in complete schedules in 1952–55, when infestation was rather lighter, and gave excellent control at about 14 and 16 oz., respectively, in concentrated sprays or at 3·6 and 4 oz. in dilute ones; although these compounds gave protection for a relatively short time, they appeared to be as effective as DDT under field conditions. In complete schedules, methoxy-DDT was as effective as DDT when infestation was light but slightly less so when it was heavier. Diazinon [O,O-diethyl O-2-isopropyl-4-methyl-6-pyrimidinyl phosphorothioate] and Guthion [O,O-dimethyl S-(4-oxo-benzotriazino-3-methyl) phosphorodithioate] gave results comparable with those from DDT and parathion, and Perthane [1,1-bis(p-ethylphenyl)-2,2-dichloroethane (ethyl-DDD)] and Dilan [a 1:2 mixture of

1,1-bis(p-chlorophenyl)-2-nitropropane and 1,1-bis(p-chlorophenyl)-2-nitrobutane] were promising against light infestations, but require further tests against heavy ones. All these insecticides were as effective in concentrated as in dilute sprays.

Snapp (O. I.). **Control of the Plum Curculio with Soil Insecticides.**—*J. econ. Ent.* **50** no. 4 pp. 457–459, 2 refs. Menasha, Wis., 1957.

Tests in Georgia, in which first-generation larvae of *Conotrachelus nenuphar* (Hbst.) were allowed to pupate in boxes of soil treated with an insecticide, begun with aldrin and dieldrin in dusts in 1952 [*cf. R.A.E.*, A **41** 284], were continued with heptachlor and isodrin at 4 lb. per acre in dusts in 1953, aldrin at 4 lb. in granules or emulsion concentrate in 1954, chlordane at 4 lb. in granules in 1955 and heptachlor at 2 lb. in granules in 1956, and all treatments were retested each year. The aldrin and dieldrin dusts were still very effective after four years, and rather more so at 4 than at 2 lb. per acre. Except for isodrin, which lost toxicity sharply after a year, all the materials applied in 1953–55 were highly effective in all years, including 1956, the heptachlor dust giving complete control throughout. Aldrin in granules and emulsion showed no marked difference due to formulation, and the heptachlor granules applied in 1956 gave complete control in that year. The percentage emergence in untreated soil ranged from 40·8 in 1955 to 67·9 in 1952.

Tests were also carried out in a peach orchard in 1954–56, aldrin being applied to the soil beneath the trees in January–March at 4 lb. per acre in dusts or at 2 lb. per acre in granules and worked in immediately or after 2–4 weeks. All treatments reduced the numbers of adults jarred from the trees in summer, but infestation was too low for definite conclusions. Control appeared to be best when the insecticide was worked into the soil immediately after application. In cages infested with 200 mature larvae on 9th May 1956, no adults emerged from the soil treated with aldrin and 99 from untreated soil.

It is concluded that it may be possible to control *C. nenuphar* in peach orchards for four or more years by a single application of a soil insecticide and so to eliminate the use of insecticides on the fruit.

Brazzel (J. R.), Newsom (L. D.), Roussel (J. S.), Gaines (R. C.) & Cascio (T.). **The Effect of Food on Fat Accumulation of resistant and susceptible Boll Weevils.**—*J. econ. Ent.* **50** no. 4 pp. 459–462, 4 graphs, 7 refs. Menasha, Wis., 1957.

As the susceptibility of insects to chlorinated-hydrocarbon insecticides has been thought to vary inversely with their fat content [*cf. R.A.E.*, A **43** 236; **46** 202], investigations were made in Louisiana on the fat content (total ether-extractable material expressed as a percentage of the dry weight) of examples of *Anthonomus grandis* Boh. normally susceptible to these insecticides and examples from a district (St. Joseph) in which the weevil had acquired resistance to them [*cf.* next abstract]. Adults from larvae reared on cotton squares or bolls were fed on blossoms, squares or bolls, and fat contents were determined at intervals for up to 20 days. The results showed that the rate and amount of fat accumulation was about the same for weevils of the resistant and the susceptible strains. Those from larvae reared on bolls contained more fat than those from larvae reared on squares, both before and after adult feeding, the difference remaining approximately constant. Both accumulated more fat from bolls and less from squares than

from flowers, and the percentage water content decreased as the percentage fat content increased. Resistance to the insecticides was thus not correlated with fat accumulation.

Roussel (J. S.) & Clower (D. F.). **Resistance to the Chlorinated Hydrocarbon Insecticides in the Boll Weevil.**—*J. econ. Ent.* **50** no. 4 pp. 463–468, 1 map, 8 refs. Menasha, Wis., 1957.

Poor control of *Anthonomus grandis* Boh. on cotton in parts of Louisiana in the late summer of 1954 was attributed to adverse weather, but became even more marked in 1955 in districts in which chlorinated-hydrocarbon insecticides had previously afforded control. Laboratory tests were begun in July 1955 with weevils reared from bolls collected in areas in which control had failed and in one (Baton Rouge) in which it had not. Cage tests in which the untreated weevils were allowed to feed on dusted cotton terminals showed that toxaphene and endrin and mixtures of DDT with dieldrin, BHC or heptachlor were much less effective against those from St. Joseph (a resistant area) than against the susceptible strain, whereas Phosdrin [dimethyl 2-methoxycarbonyl-1-methylvinyl phosphate] and calcium arsenate were about equally effective against both, except at the lower rates of application, at which lower control of the resistant population is held to indicate an inherited vigour tolerance, developed simultaneously with resistance to chlorinated hydrocarbons. Topical application of the insecticides to weevils from the various localities showed that the LD50 for endrin was approximately 145 times as great for the St. Joseph strain as for the susceptible one, and that for Guthion [O,O-dimethyl S-(4-oxo-benzotriazino-3-methyl) phosphorodithioate] about twice as great, possibly indicating a vigour tolerance, and similar results were obtained in 1956. Randomised field tests in both years showed that resistance to chlorinated hydrocarbons had developed over some two-thirds of the cotton-producing areas of Louisiana, the distribution of which is shown on a map, but that the resistant weevils could be controlled by dusts of Guthion, EPN [O-ethyl O-p-nitrophenyl phenylphosphonothioate], methyl-parathion or calcium arsenate.

Arnold (J. W.). **Toxicity and Repellency of Paradichlorobenzene to Larvae of the Black Carpet Beetle.**—*J. econ. Ent.* **50** no. 4 pp. 469–471, 1 fig., 6 refs. Menasha, Wis., 1957.

Tests in a simple olfactometer, which is described, showed that the vapour of p-dichlorobenzene was significantly and highly repellent to larvae of *Attagenus megatoma* (F.) (*piccus* (Ol.)) at concentrations of 2·8 and 3·2 mg. per litre, respectively; naphthalene, camphor and cedar oil were highly repellent at lower concentrations but have much lower vapour pressures, so that effective concentrations are less readily obtained. When the larvae were exposed in flasks to concentrations of 0, 1, 2, 3 and 4 mg. p-dichlorobenzene per litre for 24, 48 or 72 hours, the amount of woollen fabric consumed decreased as vapour concentration increased, and the decrease was significant at 3 mg. in 24–48 hours and at 2 mg. in 72 hours. All larvae died in 14 days or less when exposed to concentrations of 3 mg. per litre or more, whereas 38 and 56 per cent. survived exposure for 30 days to concentrations of 2 and 1 mg., respectively. It is concluded that a vapour concentration of about 3 mg. per litre, about half the amount required for saturation, is necessary to repel the larvae and must be maintained for about a fortnight

to kill them. This concentration, which is somewhat irritating to man, would be unlikely to develop in a cupboard in daily use, but could be maintained in trunks or impermeable bags.

Sengupta (G. C.) & Behura (B. K.). **On the Biology of** *Lema praeusta* **Fab.**—*J. econ. Ent.* **50** no. 4 pp. 471–474, 1 fig., 6 refs. Menasha, Wis., 1957. **Note on the Life-history of** *Lema semiregularis* **Jac. (Coleoptera, Chrysomeloidea, Crioceridae).**—*J. Bombay nat. Hist. Soc.* **53** no. 3 pp. 484–485, 6 refs. Bombay, 1956.

Lema praeusta (F.), *L. signatipennis* Jac. and *L. semiregularis* Jac. are stated in these two papers to be minor pests of turmeric (*Curcuma longa*) growing in the district of Phulbani, Orissa [*cf. R.A.E.*, A **45** 215]. They were first observed in 1949 and did considerable damage to the crop in later years in July–October. Their bionomics are very similar. Field and laboratory observations on *L. praeusta*, recorded in the first paper, showed that the adults paired 4–5 days after emergence and that eggs were laid 8–10 days later, singly in the leaves. The larvae fed on the leaf tissues and pupated between the leaves in the laboratory, but usually in the soil in the field. The adults were active during the day and fed on the leaf surface. The egg, larval and pupal stages lasted 8–10, 10–12 and 15–25 days, respectively, four adults lived for 43–60 days, and the females deposited 21–68 eggs each. Damaged leaves dry up, and counts of leaves in October 1950 showed 9·2–13·5 per cent. infestation. *L. praeusta* was also observed feeding on the leaves of cucurbits, brinjal (*Solanum melongena*) and sorghum in the field. A list of the food-plants of economic importance recorded for different species of *Lema* is included.

Similar observations on *L. semiregularis*, recorded in the second paper, showed that the egg, larval and pupal stages lasted 4–5, about 15 and about 19 days, respectively, and that the females laid up to 11 eggs in 24 hours.

Stombler (V.), Pelekassis (C. D.) & Doyle (E. S.). *Drosophila* **Control on harvested Tomatoes for processing in California 1956.**—*J. econ. Ent.* **50** no. 4 pp. 476–480, 7 refs. Menasha, Wis., 1957.

Tests of pyrethrum for the control of *Drosophila* spp., mainly *D. melanogaster* Mg., ovipositing in picked tomatos [*cf. R.A.E.*, A **45** 277–278] were made in California in 1956. Treatments were applied to stacks of filled boxes in the field or to larger stacks of 42 boxes at the receiving station or cannery, and a dust containing 0·11 per cent. pyrethrins gave excellent protection of both against egg-laying for about 24 hours, after which the degree of protection rapidly declined; thorough application from the sides and over the top was essential, and the effect appeared to be due to a repellent rather than a toxic effect. Inert dusts also tended to reduce oviposition. The pyrethrum dust was much more effective than a DDT smoke or than pyrethrins as a smoke or mist when applied directly to the stacked boxes, but about as effective as the mist when applied to all parts of a partly enclosed storage shed, including the tomatos. There was no evidence that the dust affected the flavour of the fruits or created a residue problem.

In subsidiary investigations, egg deposition almost ceased at a storage temperature of 12°C. [53·6°F.] and increased rapidly as temperature rose above 15°C. [59°F.]. It was greatest when the tomatos were ripe or slightly over-ripe and increased from an average of about 2 per fruit in one hour of exposure to about 25 in two hours and 218 in four hours in a storage shed in which the flies were numerous.

Bielarski (R. V.), Roussel (J. S.) & Clower (D. F.). **Biological Studies of Boll Weevils differing in Susceptibility to the Chlorinated Hydrocarbon Insecticides.**—*J. econ. Ent.* **50** no. 4 pp. 481–482, 11 refs. Menasha, Wis., 1957.

The following is almost entirely based on the authors' summary. Biological studies were made on two strains of *Anthonomus grandis* Boh., one quite susceptible to chlorinated-hydrocarbon insecticides and the other from an area (St. Joseph) in Louisiana in which the weevil had acquired resistance to them [*cf. R.A.E.*, A **46** 344]. The latter proved very resistant to endrin applied topically in laboratory tests. The studies showed no difference in the average number of eggs laid per female per day, duration of the larval or pupal stage or time required to develop from egg to adult, and this is regarded as strong evidence that selection for resistance in the population was carried on independently of inheritance for other biological characters.

Lindquist (D. A.) & Dahm (P. A.). **Some chemical and biological Experiments with Thiodan.**—*J. econ. Ent.* **50** no. 4 pp. 483–486, 3 figs., 2 refs. Menasha, Wis., 1957.

Thiodan (6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-6,9-methano-2,4,3-benzodioxathiepin-3-oxide) is apparently a mixture of two stereoisomers [*cf. R.A.E.*, A **46** 141]. These isomers were separated by column and paper chromatography. Ultraviolet spectra of purified Thiodan, its isomers and Thiodan alcohol (1,4,5,6,7,7-hexachloro-2,3-bis(hydroxymethyl)bicyclo(2.2.1)-heptene-5) obtained by acid hydrolysis of technical Thiodan yielded identical curves, but infra-red spectra showed significant differences between them. Analysis by paper chromatography and comparison of infra-red spectra showed that the alcohols obtained by hydrolysis of the isomers were identical with Thiodan alcohol and that the reaction of either of the two alcohols with thionyl chloride yields Thiodan identical with purified Thiodan. It appeared that Thiodan alcohol consists of only one isomer, and that some rearrangement of it is caused by the reaction with thionyl chloride.

From the results of topical application of acetone solutions to females of a non-resistant strain of *Musca domestica* L., the LD50's in μg. per g. body weight and (in brackets) per fly were estimated to be 6·7 (0·15) for both technical and purified Thiodan, 6·2 (0·14) and 8·5 (0·19) for the two isomers and 9·4 (0·21) for DDT. The acute oral LD50 of purified Thiodan for male white rats was between 40 and 50 mg. per kg.

Lukefahr (M.) & Griffin (J.). **Mating and Oviposition Habits of the Pink Bollworm Moth.**—*J. econ. Ent.* **50** no. 4 pp. 487–490, 3 graphs, 9 refs. Menasha, Wis., 1957.

The following is based largely on the authors' summary. Observations on the behaviour of adults of *Platyedra* (*Pectinophora*) *gossypiella* (Saund.) under various conditions of temperature, humidity and light were made at Brownsville, Texas, in 1954–56. The results showed that mating occurred between 2 a.m. and 5 a.m. and that 28 of 100 pairs mated at least twice, sometimes at an interval of several days. When cotton terminals were provided, the peak of oviposition occurred on the third night after emergence, and more than 80 per cent. of the eggs were laid before midnight. A light intensity of 0·02 foot-candle or below appeared to be optimum for activity and oviposition. Relative humidities of 50–90 per cent. and temperatures of 70–90°F. did not affect either, but both were sharply reduced at lower temperatures. On caged plants, bolls and terminals were the preferred oviposition sites.

Medler (J. T.). **Migration of the Potato Leafhopper—a Report on a cooperative Study.**—*J. econ. Ent.* **50** no. 4 pp. 493–497, 6 refs. Menasha, Wis., 1957.

As *Empoasca fabae* (Harris) does not overwinter in the more northerly parts of its range in the United States and infestation of potato, lucerne and other plants there was thought to result from migration from the south [*cf. R.A.E.*, A **23** 468; also **46** 310], a co-operative survey was carried out in various north-central and southern States in 1951–54 to determine the dates of first appearance of the Cicadellid. The results showed that the insect was not present in the north-central States during early spring, but appeared each year as a migrant in April and May. The first examples were mainly adult females. Collections made in the Gulf States indicated that *E. fabae* overwinters in the latitude of Baton Rouge, Louisiana, particularly on leguminous plants, and is widespread early in the spring in the lower Mississippi River Valley. The work was to be continued.

Holloway (J. K.) & Huffaker (C. B.). **Establishment of the Seed Weevil, *Apion ulicis* Forst., for Suppression of Gorse in California.**—*J. econ. Ent.* **50** no. 4 pp. 498–499, 9 refs. Menasha, Wis., 1957.

Gorse (*Ulex europaeus*), which was introduced into the United States from Europe as an ornamental plant, has escaped from cultivation in the northern coastal counties of California and spread over farm lands. It can be controlled by a combination of burning, chemical treatment and soil cultivation, but the process must be continued for a number of years and is relatively expensive, so that the introduction of *Apion ulicis* (Forst.) from France to supplement these measures was considered. The weevil causes negligible damage to established plants, but destroys a high proportion of the seeds [*cf. R.A.E.*, A **16** 540] and so may reduce or prevent spread.

Tests showed that *A. ulicis* did not feed or reproduce on sweet clover (*Melilotus alba*), *Lotus corniculatus* or *Robinia pseudacacia*, and breeding stock was therefore introduced in July 1952; 95 adults were obtained by July 1953, and these were liberated on a caged plant in Mendocino County. The cage was removed to permit pollination and normal setting of pods in the spring of 1954, when oviposition was expected. Additional adults were introduced in March 1954 and liberated at the same place and in San Mateo County, and adults of the subsequent generation were recovered in October. Weevils were readily found near the release point in Mendocino County in July 1955 and had increased considerably in numbers and spread for 100 yards by July 1956, when they were also found at the other release point, in spite of a fire that had occurred in 1955.

Bean (J. L.) & Batzer (H. O.). **Mean Head Width for Spruce Budworm Larval Instars in Minnesota and associated Data.**—*J. econ. Ent.* **50** no. 4 p. 499, 2 refs. Menasha, Wis., 1957.

Recognition of the larval instars of *Choristoneura fumiferana* (Clem.) is essential when precise information on the seasonal development of populations is required for timing aerial sprays. Measurements of the width of the head capsules of larvae reared on balsam fir [*Abies balsamea*] and white spruce [*Picea glauca*] were made over a period of two years at Ely, Minnesota, and are compared with those of larvae from Douglas fir [*Pseudotsuga menziesii*] in Oregon and *A. balsamea* in New York and Ontario. The maximum width for the first instar and the minimum for the second instar

of the Minnesota larvae were the only measurements that overlapped; the mean widths for the Minnesota and Ontario larvae did not differ significantly, but those for the fifth and sixth instars of the Oregon larvae were significantly greater than those for larvae from the other areas.

Blinn (R. C.), Gunther (F. A.), Ortega (J. C.) & Elliott (L. M.). **Harvest Residues of Schradan in Meats of Field-treated Walnuts.**—*J. econ. Ent.* **50** no. 4 pp. 500–501, 2 refs. Menasha, Wis., 1957.

In view of the promising control of *Chromaphis juglandicola* (Kalt.) on walnut in California given by schradan [*cf. R.A.E.*, A **44** 373], the insecticide residue in the kernels of harvested walnuts was determined. The method used is described in detail. The trees were sprayed by means of a spray-blower with 1–2 lb. schradan in 400 U.S. gals. emulsion spray per acre, once on 21st May, 6th July or 21st August 1956, or twice on 21st May or 6th July and 21st August, and analysis of ground dried kernels from nuts picked on 21st September showed no appreciable contamination from sprays applied at either rate in August. The July treatments resulted in the largest residues, but they did not exceed 0·34 part per million for the lower dose or 0·77 p.p.m. for the higher.

Hacskaylo (J.) & Clark (J. C.). **Thimet Uptake by Pima S-1 Cotton and its Effect on Seedling Emergence.**—*J. econ. Ent.* **50** no. 4 pp. 501–502, 2 refs. Menasha, Wis., 1957.

The Pima S-1 variety of cotton has seeds with hard coats, which delay germination unless the seeds are previously immersed in hot water. Treatment of cotton seeds with systemic insecticides has been reported to impair germination or early plant growth under some conditions, and an experiment was therefore carried out to determine the effect of seed treatment with Thimet [O,O-diethyl S-ethylthiomethyl phosphorodithioate] on the germination of seed of the hard-coated variety.

Seeds of Pima S-1 (untreated or immersed in water at 85°C. [185°F.] for 75 seconds) and of the Deltapine variety, used as a standard, were coated with Thimet in a carbon-impregnated dust at the rate of 4 lb. per 100 lb. seed and sown on 14th September 1956. Daily counts until 26th September showed that the Pima seedlings appeared sooner and had a higher final stand count after hot-water immersion of the seed than without it, and that, in each of these categories, seeds coated with Thimet germinated more rapidly than uncoated seeds. The increase in final percentage emergence for Thimet was 6·5 after hot-water treatment, but very small without it. Treating Deltapine seeds with Thimet slightly reduced the rate of seedling emergence, but did not affect the final stand. All seedlings from Thimet-treated seed gave complete kill of Aphids (*Aphis gossypii* Glov.) placed on them 49 days after sowing, and all began to lose their residual toxicity eight days later, from which it is concluded that Pima S-1 and Deltapine absorbed Thimet in comparable quantities.

Frick (K. E.). **Biology and Control of Tiger Beetles in Alkali Bee Nesting Sites.**—*J. econ. Ent.* **50** no. 4 pp. 503–504, 1 ref. Menasha, Wis., 1957.

The growing of lucerne for seed in the Roza irrigation district of Washington has increased because of the natural dispersal of the principal pollinator,

Nomia melanderi Ckll. The bees were reported to be attacked during the nesting season by adults and larvae of Cicindelids, and investigations were therefore made. They showed that *Cicindela haemorrhagica* Lec. and *C. pusilla imperfecta* Lec. were present, but although the adults were observed to attack the bees and they fed on those killed by birds, there was no evidence that they hindered nesting. The larvae were unable to kill European earwigs [*Forficula auricularia* L.] that were more than half-grown, and it is considered unlikely that they could overcome a bee. The Cicindelids are therefore of only minor importance as predators of *N. melanderi*. Observations on their bionomics are described, and it is reported that emulsion sprays of 0·25 lb. parathion or 0·5 lb. heptachlor per 100 U.S. gals., applied in early spring to wet the soil surface round the larval galleries, gave complete kill of the larvae, whereas aldrin and malathion were less effective.

Richardson (B. H.). **Control of Onion Thrips in the Winter Garden Area of Texas, 1956.**—*J. econ. Ent.* **50** no. 4 pp. 504–505, 2 refs. Menasha, Wis., 1957.

Further tests of insecticides were made in 1956 for control of *Thrips tabaci* Lind. on onion in the Winter Garden area of Texas, where the thrips had shown evidence of resistance to chlorinated hydrocarbons [*cf. R.A.E.*, A **45** 264]. When applied as sprays in 21 U.S. gals. water per acre, 1·25 lb. malathion, 0·5 lb. Chlorthion [O,O-dimethyl O-3-chloro-4-nitrophenyl phosphorothioate], methyl-parathion, diazinon [O,O-diethyl O-2-isopropyl-4-methyl-6-pyrimidinyl phosphorothioate] or Guthion [O,O-dimethyl S-(4-oxobenzotriazino-3-methyl) phosphorodithioate] and 0·25 lb. parathion gave over 90 per cent. reductions in population seven days after application, 0·25 lb. Phosdrin [dimethyl 2-methoxycarbonyl-1-methylvinyl phosphate] 74 per cent. reduction and 0·5 lb. Dipterex [dimethyl 2,2,2-trichloro-1-hydroxyethylphosphonate] or methyl-demeton [dimethyl 2-(ethylthio)ethyl phosphorothioate] and 0·4 lb. Sevin (N-methyl-1-naphthyl carbamate) rather poor control, whereas 2 lb. toxaphene, 0·5 lb. heptachlor, dieldrin or Perthane [1,1-bis(p-ethylphenyl)-2,2-dichloroethane (ethyl-DDD)], 0·4 lb. endrin and a mixture of 0·3 lb. γ BHC with 0·5 lb. DDT gave very poor control. Mixtures of 0·25 lb. parathion with 0·38 lb. dieldrin and of 0·625 lb. malathion with 0·38 lb. dieldrin or 0·5 lb. heptachlor gave better initial and residual control than dieldrin or heptachlor alone, but were less effective than parathion or malathion alone, and 0·625 lb. malathion with 0·5 lb. Perthane gave good initial but poor residual control. It is concluded that the thrips have definitely acquired resistance to chlorinated-hydrocarbon insecticides in the area.

Steiner (L. F.), Miyashita (D. H.) & Christenson (L. D.). **Angelica Oils as Mediterranean Fruit Fly Lures.**—*J. econ. Ent.* **50** no. 4 p. 505, 3 refs. Menasha, Wis., 1957.

Oils from the seeds and roots of angelica (*Archangelica officinalis*) were found in Hawaii in March 1956 to be outstanding attractants for the males of *Ceratitis capitata* (Wied.), and further tests were made with the seed oil, which is the more readily available. Only the virgin oils were attractive. Field tests in Hawaii and Florida showed that the use of the seed oil resulted in catches of males several times as large as the catches of both sexes in traps containing 5 per cent. each of protein hydrolysate and ammonium chloride in water, which had previously given very good results, and sexually immature males only two days old were strongly attracted to it. In Florida, it was best applied to a 1·5-inch length of cotton dental roll

in dry traps at the rate of 0·5 ml. per trap; 3 per cent. DDVP [dimethyl 2,2-dichlorovinyl phosphate] was added as a toxicant, and a pinch of 5 per cent. chlordane dust was placed in each trap to prevent the removal of the flies by ants. The roll was re-treated once a week, and catches increased as a result of the accumulation of attractant. The substitution of technical malathion for DDVP or of DDT for chlordane reduced the catches. The fact that the flies tended to avoid fresh oil or delay entering the traps after congregating on or near them suggested the possible presence of a repellent constituent. The oil was extensively used in the eradication programme in Florida in 1956 [*cf. R.A.E.*, A **45** 259], until stocks were exhausted. Biological tests showed that oils produced in 1956 tended to be less effective than those produced earlier, suggesting that ageing may increase attractiveness. The attractive constituents are unknown.

Neel (W. W.). **Insecticide Tests to control the Hickory Shuckworm on Pecans.**—*J. econ. Ent.* **50** no. 4 pp. 507–508, 1 ref. Menasha, Wis., 1957.

Enarmonia (*Laspeyresia*) *caryana* (Fitch) caused heavy losses of pecan nuts in western and northern Mississippi in 1955, and investigations on its control were made in 1956. In an orchard in which no early infestation developed and infestation at harvest was light, 1–3 fortnightly applications of 2 lb. 25 per cent. wettable EPN [O-ethyl O-p-nitrophenyl phenylphosphonothioate] per 100 U.S. gals. were made either early or late in the season, between 25th July and 5th September, and 2–3 late applications appreciably reduced infestation [*cf. R.A.E.*, A **43** 328].

Steiner (L. F.). **Low-cost Plastic Fruit Fly Trap.**—*J. econ. Ent.* **50** no. 4 pp. 508–509, 1 fig., 1 ref. Menasha, Wis., 1957.

The use of angelica-seed oil on dental cotton as an attractant for *Ceratitis capitata* (Wied.) in Florida [*cf.* preceding abstract but one] led to the development of a plastic trap that was lighter, cheaper and easier to handle than the standard glass ones. It consisted of a cylinder of polystyrene with openings at both ends, which was suspended horizontally, and its construction is described in detail. The dental cotton, impregnated with angelica-seed oil to which 2–3 per cent. DDVP [dimethyl 2,2-dichlorovinyl phosphate] was added, was suspended in the middle at right angles to the long axis of the trap, and a pinch of chlordane dust was put in the trap once a week to control ants [*cf. loc. cit.*]. The chlordane could be replaced by dieldrin granules or wettable malathion powder, but these are more harmful to the polystyrene plastic. More than 60,000 of these traps were obtained for use in the eradication campaign against *C. capitata* in Florida [*cf. R.A.E.*, A **45** 259]. They also proved effective in tests against *Dacus dorsalis* Hend. and *D. cucurbitae* Coq. when baited with appropriate lures, and the possibility of the combined use of baits for two or more species is envisaged.

Gould (G. E.) & Wilson (M. C.). **Granulated Insecticides for European Corn Borer Control.**—*J. econ. Ent.* **50** no. 4 pp. 510–511. Menasha, Wis., 1957.

Granular insecticides were compared with sprays for the control of *Pyrausta nubilalis* (Hb.) on maize in Indiana in 1956. The granules were distributed at about 20 lb. per acre from an appliance that had a single

outlet about 12 ins. above the plants and spread them in a 9-inch band, and the sprays were applied at 20 U.S. gals. per acre from three nozzles per row.

Sweet maize, sown on 10th May, was sprayed on 21st and 25th June or treated with granules on the second date. The granules formed noticeable deposits in the whorls and at the bases of the upper leaves, adhered well and left traces that were still present three weeks later, after about 1·75 ins. of rain had fallen. Counts of larvae and of infested plants on 10th and 18th July showed that 2 lb. DDT per acre in a spray gave very good control and was significantly better than 1 lb. DDT, 0·2 lb. endrin, 0·4 lb. dieldrin or 0·5 lb. heptachlor per acre in granules, though all treatments were significantly better than none. At harvest, on 31st July, 25 per cent. of the ears from untreated and 2–8 per cent. of those from the variously treated plants were infested by *P. nubilalis*; infestation by the earworm [*Heliothis zea* (Boddie)] was not affected.

On field maize, sown on 11th May, sprays and granules were applied on 25th June, and counts of larvae 1–3 weeks later showed that 0·2 lb. endrin, 0·4 lb. dieldrin, 0·5 lb. heptachlor, and 1 lb. aldrin per acre in granules gave good control and were as effective as 1·5 lb. DDT in a spray; 1 lb. DDT in granules and 2 lb. toxaphene and 0·1 lb. endrin in sprays were less effective, but gave significant control. The eggs of the second generation were deposited in August and September, and damage by late larvae was therefore negligible; the treatments had no effect on these, but there was a significant correlation between the number of first-generation larvae and yield.

In tests made in cooperation with farmers, applications of DDT, dieldrin, aldrin, heptachlor and endrin in granules on 26th–28th June reduced the borer population by two-thirds or more.

Rai (L.), Burkhardt (C. C.) & Roan (C. C.). **The Effects of Alfalfa Dehydration upon Residues of Malathion.**—*J. econ. Ent.* **50** no. 4 pp. 511–512, 4 refs. Menasha, Wis., 1957.

The following is based largely on the authors' summary. A single experiment was carried out in Kansas to investigate the effect of dehydration of lucerne on the residues from malathion sprays applied at the rate generally recommended against insect pests. Plants 12–14 ins. high were sprayed with a 57 per cent. emulsion concentrate diluted to give 15 oz. actual malathion in 13 U.S. gals. spray per acre, and cut and hauled to the dehydration plant immediately. Samples of chopped green and chopped dehydrated lucerne and of lucerne meal and pellets were analysed colorimetrically and showed average residues of 62, 19, 27 and 20 parts per million, respectively, indicating a loss of about 69 per cent. of the residue during dehydration; the unexpectedly high figure for the meal was attributed to non-homogeneous sampling.

Harwood (R. F.) & Arfekul (S.). **A Rearing Trap for producing Pomace Flies for Bioassay of Insecticides.**—*J. econ. Ent.* **50** no. 4 pp. 512–513, 1 fig. Menasha, Wis., 1957.

When adults of *Drosophila melanogaster* Mg. of known age are required in large numbers for tests, collection from the culture jars is laborious. A procedure was therefore devised in which eight jars are attached beneath the top of a wooden box, through which the emerging adults, attracted by light, enter plastic tubes that ultimately lead to a removable screen cage, in the top of which a plug of cheesecloth soaked in 5 per cent. sucrose

solution is inserted. The flies are removed every 24 hours, and it was found by observation of ovary development that only 1–2 per cent. of them had emerged more than 24 hours previously.

For continuous production, culture jars of 1 U.S. gal. capacity are used. A half-inch layer of moistened canned pumpkin is placed in the bottom as rearing medium, with a few granules of dried live yeast sprinkled on top and a paper towel to serve as a pupation site, and 400 adults are liberated in each jar. These are removed after a week, and about eight days later, when the first new adults are about to emerge, the jars are placed in the box. With eight jars in the box and the oldest culture replaced daily, about 3,000 adults of both sexes were produced per day. Tests against insecticide deposits indicated that the population produced was homogeneous.

Kantack (B. H.) & Laudani (H.). **Comparative Laboratory Tests with Emulsion and Wettable-powder Residues against the Indian-meal Moth.**—*J. econ. Ent.* **50** no. 4 pp. 513–514. Menasha, Wis., 1957.

Infestation of stored foodstuffs by *Plodia interpunctella* (Hb.) was more than usually troublesome in the United States in 1955–56 and persisted in several instances in spite of treatment of the surface of the commodities and the space above with sprays of pyrethrum in oil or pyrethrum emulsion. Laboratory tests were therefore carried out on the residual toxicity of sprays of pyrethrum synergised with piperonyl butoxide and of malathion and methoxy-DDT (methoxychlor) to the larvae and adults. The insecticides were applied to 15-lb. Kraft paper, laminated to aluminium foil, because this surface most nearly matched that of grain and other infested commodities in chemical and absorptive qualities. Newly emerged adults were confined for four hours in cartons lined with paper bearing 2-day-old residues of 10 mg. pyrethrum with 100 mg. piperonyl butoxide, 50 mg. malathion or 200 mg. methoxy-DDT per sq. ft., and mortality records made immediately and 24 hours later showed that they were very susceptible to the residues from either wettable-powder or emulsion sprays of all the insecticides. Last-instar larvae, which were exposed to residues of the same materials 2 and 28 days old in various concentrations and mixtures, were much more resistant; 100–200 mg. malathion per sq. ft. gave higher mortality than did 400 mg. methoxy-DDT or than 10 mg. pyrethrum with 100 mg. piperonyl butoxide; adding methoxy-DDT or synergised pyrethrum to malathion did not improve the kill, but adding synergised pyrethrum to methoxy-DDT caused some improvement in wettable-powder sprays. Deposits from wettable powders acted more quickly than those from emulsion formulations and gave much higher mortalities, particularly of larvae, and the results were as good after 28 as after two days of ageing. It is therefore considered that the substitution of wettable-powder sprays for emulsions and even possibly oil solutions may improve control of *P. interpunctella* in practice.

McGough (J. M.) & Noble (L. W.). **Summary of Work at Brownsville, Texas, with imported Pink Bollworm Parasites and an Aphid Predator.**—*J. econ. Ent.* **50** no. 4 p. 514, 3 refs. Menasha, Wis., 1957.

Further releases of *Apanteles angaleti* Mues. [*cf. R.A.E.*, A **45** 378], *Bracon brevicornis* Wesm., *B. gelechiae* Ashm., *Chelonus narayani* Subba Rao [*cf.* **45** 66], and *C. heliopae* Gupta, introduced from India for trial against *Platyedra* (*Pectinophora*) *gossypiella* (Saund.) on cotton [*cf.* **44** 393], were made in Texas and Mexico in 1955, but no recoveries of these

Braconids were made from 85,000 bolls collected subsequently at 170 liberation sites, mainly in the Rio Grande Valley.

Two shipments comprising 150 adults of *Menochilus* (*Cheilomenes*) *sexmaculatus* (F.), a Coccinellid predacious on Aphids, were received in Texas from India in April 1954 and used to propagate colonies that were released in Texas and Mexico in 1954 and 1955. Adults and larvae were found in Cameron County, Texas, in 1955, after about four generations had developed, but at no liberation points in either Texas or Mexico in 1956, so that it is concluded that the Coccinellid did not become established.

Swank (G. R.), Davis (D. F.) & Gertler (S. I.). **N-Pentylphthalimide as a Repellent for possible Use on Insect-resistant Packaging.**—*J. econ. Ent.* **50** no. 4 pp. 515–516, 3 refs. Menasha, Wis., 1957.

Several hundred compounds were tested at Savannah, Georgia, as repellents for use in preparing packaging materials that would be resistant to insects. Adults of *Tribolium* spp. were confined on an arena composed of equal areas of treated and untreated kraft paper, and the average deviation from an established normal distribution on untreated paper determined over a period of five days. The results showed that all the compounds except N-pentylphthalimide were inferior to pyrethrum synergised with piperonyl butoxide.

When various deposits of N-pentylphthalimide were compared with one of 10 mg. pyrethrum and 100 mg. piperonyl butoxide per sq. ft., tests made at intervals for three months after treatment showed that the experimental compound was less repellent than the synergised pyrethrum at 25 and 50 mg., equally repellent at 100 mg. and more repellent at 200 mg. per sq. ft. As it is reported also to repel rodents, N-pentylphthalimide is considered promising for the protection of packaged foods and other commodities.

King (D. R.) & Morris (H. F.). **The Plum Curculio in East Texas.**—*J. econ. Ent.* **50** no. 4 pp. 516–517. Menasha, Wis., 1957.

Investigations were begun in eastern Texas in 1954 on the seasonal history of *Conotrachelus nenuphar* (Hbst.) on stone fruits. Records made by jarring plum, peach and nectarine trees showed that the overwintered adults usually emerged from hibernation between late March and early May. They oviposited in plums and early varieties of peach early in the season and in nectarines and peaches that ripen in the middle or late season from early May, when the plums were nearly mature. The combined egg and larval stages averaged 24 days in April and 19 in May, and the first-generation adults left the soil 20–41 days after the larvae had entered it. Mortality of the first generation was low in April and early May, after which it steadily increased until the plums were harvested; it occurred mainly among adults before they left the pupal cells. Adults of the first generation did not oviposit in plums, which were nearly ripe, but laid small numbers of eggs in nectarines and peaches of late varieties; very few larvae of the second generation reached the adult stage.

During normal years, economic populations of second-generation adults develop on peach, but when rainfall is low, the mortality of both generations is high and populations on peach are low. As a result, the weevil appears in damaging numbers in eastern Texas on peaches that ripen in mid-season only in years in which optimum rainfall and temperatures prevail during late spring and summer.

Matthysse (J. G.). **Research on insecticidal Control of Philippine Crop Pests.**—*J. econ. Ent.* **50** no. 4 pp. 517–518. Menasha, Wis., 1957.

Notes are given on research carried out on the control of crop pests in the Philippines since the end of the late war. Rice, the most important crop, is attacked by borers, including *Chilo suppressalis* (Wlk.), *Schoenobius incertulas* (Wlk.) and *Sesamia inferens* (Wlk.), which are its most injurious pests, and by *Leptocorisa acuta* (Thnb.), which damages the grains in the milky stage. Endrin and EPN [O-ethyl O-p-nitrophenyl phenylphosphonothioate] proved the most effective insecticides for borer control, but must be applied at least three times during the susceptible stage of plant growth [*cf. R.A.E.*, A **46** 34]. Maize is next in importance and is attacked by *Pyrausta nubilalis* var. *salentialis* (Sn.), *Heliothis armigera* (Hb.) and several other insects. Insecticides have given good control, but are not economically profitable in view of the low yields, and attempts are being made to breed resistant varieties of maize to render their use unnecessary. *Citrus* is damaged by *Prays citri* (Millière) and *P. endocarpa* Meyr., against which EPN is effective [*cf.* **46** 106] and by *Rhynchocoris longirostris* Stål, which can be controlled with dieldrin. DDT, dieldrin and endrin were generally effective against pests of potato and other vegetable crops, which included *Epilachna philippinensis* Dieke, and DDT and endrin against *H. armigera* on tobacco [*cf.* **46** 107]. The production of cacao is limited by *Helopeltis bakeri* Popp., *H. collaris* Stål, *Acrocercops cramerella* (Sn.) and other insects and diseases, and spraying with combinations of insecticide and fungicide greatly increased yields [*cf.* **46** 106]. Sugar-cane is attacked by *Argyroploce schistaceana* (Sn.), by *Scirpophaga nivella* (F.) and *S. nivella intacta* Sn., and by *Chilotraea infuscatella* (Sn.), *Sesamia inferens* (Wlk.) and *Proceras* sp., against which no insecticides showed any promise, in spite of extensive tests, though schradan and demeton [diethyl 2-(ethylthio)ethyl phosphorothioate] were very effective against *Oregma* (*Ceratovacuna*) *lanigera* (Zhnt.). Manila hemp [*Musa textilis*] is seriously threatened by the mosaic virus disease, which is transmitted by *Aphis maidis* Fitch and *A. gossypii* Glov. [*cf.* **39** 64]; spraying with BHC caused some reduction in the incidence of the disease, but demeton was ineffective, and the use of *Centrosema* as a cover crop gave better results than insecticide sprays.

Shea (W. D.). **Efficiency of Oils and other early Season Treatments for the Control of the European Red Mite.**—*J. econ. Ent.* **50** no. 4 p. 518, 2 refs. Menasha, Wis., 1957.

A superior type of petroleum oil has been recommended for use in emulsions applied to dormant fruit trees in the north-eastern United States [*cf. R.A.E.*, A **38** 109]. With a view to improving the specification and reducing still further the danger of plant injury, oils of the same general composition as that recommended but of lower viscosities were tested on apple trees bearing large populations of overwintering eggs of *Panonychus* (*Metatetranychus*) *ulmi* (Koch) in the Hudson Valley district of New York in 1956. Oils with viscosities of 59, 74, 82 and 108 secs. Saybolt at 100°F. were emulsified at 1–2 per cent. with 0·5 lb. 25 per cent. blood albumin per 100 U.S. gals., and applied immediately at the delayed-dormant stage on 30th April, about ten days before hatching began. Leaf samples inspected in June showed that all gave similar control, though the heaviest oil (GLF dormant oil) was the least effective and the lightest appeared to be slightly less effective than either of the others. The addition of 2 lb. 25 per cent. wettable malathion or 1 lb. 15 per cent. wettable parathion

per 100 U.S. gals. improved the control given by 2 per cent. GLF oil, and 1·5 pints Genite [2,4-dichlorophenyl benzenesulphonate] per 100 gals. emulsion spray was about as effective as this oil when applied on 30th April, but much more so when applied on 15th May, at the pink stage.

Chemsak (J. A.). **Use of Polyethylene Bags for inactivating Sweep Samples.**—*J. econ. Ent.* **50** no. 4 p. 523, 1 ref. Menasha, Wis., 1957.

During investigations in Pennsylvania in which insects were swept from forage crops with a net, it was found that inactivation was rapidly achieved by shaking the contents to the bottom of the net, inserting this into a 12-inch polyethylene plastic bag, adding a small amount of chloroform, and holding the top of the bag shut.

Reynolds (H. T.) & Huffman (J. W.). **Methyl Bromide Fumigation for Control of Cyclamen Mite on Strawberries.**—*J. econ. Ent.* **50** no. 4 pp. 525–526, 3 refs. Menasha, Wis., 1957.

Since strawberry plants selected for transplanting are often infested by *Steneotarsonemus pallidus* (Banks), which is a serious pest in California, fumigation was tested for control of this mite. The plants were fumigated in the laboratory at atmospheric pressure for two hours at 74°F. on 19th February and set out on the next day. They showed no fumigation injury three weeks later, and counts on 29th April showed that fumigation with 0·5–0·75 lb. ethylene dibromide, 0·75–1 lb. ethylene chlorobromide or 2–3 lb. methyl bromide per 1,000 cu. ft. had given complete or almost complete control.

Field fumigation was then tested. Heavily infested plants in a second-year field were covered with sheets of light-weight polyethylene plastic and fumigated with 1·5 lb. methyl bromide per 1,000 sq. ft. for two hours on 31st May. Vaporisation was achieved by passing through heated coils. Treatment at temperatures of 51–56 and 63–78°F. beneath the sheets gave good temporary control, but sufficient mites survived to reinfest the field. Mortalities were much higher at the higher temperatures, but temperatures exceeding 75°F. beneath the sheets during the growing season were found to cause serious plant injury. Subsequent tests showed that fumigation was most effective during the dormant season, when it generally made further treatment unnecessary and was not injurious at temperatures up to 85°F. beneath the sheets; fumigation between crops, in June or July, was rather less effective and sometimes caused temporary plant injury. A dosage of 2 lb. methyl bromide per 1,000 sq. ft. gave the best and most consistent results in commercial fields. The technique was improved by substituting opaque for clear plastic sheeting, which lengthened the daily period during which the temperature was safe for fumigation, introducing the fumigant at a number of points and using fans to vaporise and distribute it.

Box (H. E.). **Battle against Venezuela's Cane Borer.**—*Sugar* **51** no. 5 pp. 25–27, 30, 45; no. 6 pp. 34–36, 57; no. 7 pp. 30–34; 7 figs., 2 maps, 1 ref. New York, N.Y., 1956. (Also in Spanish: *Mundo azuc.* **44** nos. 6–8 repr. [12] pp., 3 figs., 1 map, 1 ref. New York, N.Y., 1956.)

The research leading to the introduction of parasites against *Diatraea* spp. on sugar-cane in Venezuela is reviewed in the first part of this paper, and the results of a survey in the early part of 1953 in regions of Aragua,

Yaracuy and Lara, in which *Metagonistylum minense* Tns. had been released, in the second [*cf. R.A.E.*, A **44** 221, etc.]. In the third part, details are given of two further campaigns in which *M. minense* was reared in the laboratory, in *D. rosa* Heinr. or *D. saccharalis* (F.), and liberated in further areas in the Aragua valley between August 1953 and November 1954 and in June–November 1955. Success was achieved in both. Surveys of the results were made in May and December 1954 and May and November 1955 and showed that both *D. rosa* and *D. saccharalis* were attacked. The percentage parasitism varied, but was 40 or even higher in some fields, and the parasite appeared able to survive even at extremely low host densities. There was a corresponding decrease in the infestation of the canes and an increase in the sugar yield. Such complete control of *Diatraea* also resulted in the almost complete disappearance of *Metamasius hemipterus* (L.), a secondary pest of canes infested by *Diatraea*.

Bates (J. F.). **The Status of Moth Borer in British Guiana.**—*Proc. Mtg Brit. W. Ind. Sug. Tech. Trinidad 1954* pp. 126–136, 8 refs. [Kingston, Jamaica, ?1956.]

A survey of the status of moth-borers on sugar-cane in British Guiana was made on representative estates in 1952–53, over 2,000 fields being examined. It was found that the percentages of stalks bored ranged from 14·9 to 78·4, with an average of 54·3, and that the percentages of internodes bored ranged from 1·4 to 9·7, with an average of 6·1. The intensity of attack (number of bored internodes per bored stalk) averaged 2·1. Comparison with the corresponding figures for earlier years, which are given [*cf. R.A.E.*, A **18** 712; **22** 388], indicated a considerable reduction of infestation over the last 10–25 years, but the resulting losses of sugar are calculated to be still relatively high. A survey of the varieties planted showed considerable difference in susceptibility to attack, ranging from 58 to 140 per cent. of the mean, and it was also found that infestation was slightly higher in ratoon than in plant cane, which is unusual, but to which no special importance is attached. Of the larvae collected, 87·4 per cent. were *Eodiatraea centrella* (Möschler) (*Diatraea canella* Hmps.), 11·9 per cent. *Diatraea saccharalis* (F.) and 0·7 per cent. *D. impersonatella* (Wlk.), indicating that there has been a great reduction in the importance of *D. saccharalis* since the introduction and liberation against it of *Metagonistylum minense* Tns. in 1933 [*cf.* **22** 388; **26** 491; **28** 547]. The percentage parasitism of *D. saccharalis* was only 5·6, which may be due to the reduction in the host population, but the Tachinid still seems able to keep the pest under control, though occasional releases of bred material may be necessary in isolated cases. Of the other parasites observed, *Ipobracon grenadensis* Ashm. and *Agathis stigmatera* (Cress.) (*Microdus diatraeae* Turner) were the most numerous, but afforded very little control. *Trichogramma minutum* Ril., which is indigenous, but is reared and liberated on one estate against the eggs, is not very effective.

Methods of chemical control, which are discussed, are considered impracticable, owing to the occurrence of 6–8 overlapping generations of the moth-borers a year, with all stages present together. In a test in 1953, gelatine capsules containing 2 g. Hanane [bis(dimethylamino) fluorophosphine oxide] were buried in the soil at the base of young cane plants about two months old, which were then infested at weekly intervals with first-instar larvae of *D. saccharalis* and *E. centrella*. Preliminary observations indicated that the larvae fed normally on the leaves and entered the stalks, but died before completion of the third instar. Such treatment would have to be repeated frequently and would be costly.

Warner (R. E.). **A new Genus and Species of Baridinae from South America (Coleoptera, Curculionidae).**—*Rev. brasil. Ent.* **6** pp. 39–42, 5 figs. São Paulo, 1956.

Laurentius eduardus, gen. et sp. n., is described from adults of both sexes reared from larvae found damaging the stems of potato in Cochabamba, Bolivia, in January 1954 and February 1955.

Caltagirone Z. (L.). **Insectos entomófagos y sus huéspedes anotados para Chile.** [Entomophagous Insects and their Hosts recorded for Chile.]—*Agric. téc.* **17** no. 1 pp. 16–48. Santiago, Chile, 1957.

This paper, which is based on the literature and the author's own observations, consists of two lists, one of insect pests of plants showing their insect parasites and predators in Chile, and the other of the parasites and predators showing the insects that they attack.

Moore (B. P.). **The Identity of *Ptinus latro* auct. (Coleoptera: Ptinidae).**—*Proc. R. ent. Soc. Lond.* (B) **26** pt. 11–12 pp. 199–202, 1 pl., 9 refs. London, 1957.

Since all type material of *Ptinus latro* F. must be presumed lost, the author proposes that this name should be sunk as a synonym of *P. fur* (L.), in accordance with the view of Illiger. The form considered by Boieldieu and later authors to be *P. latro* has recently been shown by culture experiments to be a parthenogenetic one, comprising triploid females only, which reproduce by gynogenesis, after mating with males of *P. clavipes* Panz. or, to a less extent, with those of other diploid species. It is best regarded as a triploid form of *P. clavipes*, and the name *mobilis*, n., is proposed for it. *P. brunneus* Duft. and *P. hirtellus* Sturm [*cf. R.A.E.*, A **33** 176] are considered synonyms of *P. clavipes*.

Drake (C. J.). **A new Pepper Tingid from New Britain.**—*Proc. R. ent. Soc. Lond.* (B) **26** pt. 11–12 pp. 203–205, 2 figs. London, 1957.

Nesocypselas piperica, sp. n., is described from adults of both sexes found feeding and breeding on the lower surfaces of the leaves of cultivated black pepper [*Piper nigrum*] in New Britain in January 1957. Characters distinguishing it from most other members of the genus are noted.

Calaby (J. H.) & Gay (F. J.). **The Distribution and Biology of the Genus *Coptotermes* (Isoptera) in Western Australia.**—*Aust. J. Zool.* **4** no. 1 pp. 19–39, 2 pls., 3 figs., 12 refs. Melbourne, 1956.

The authors recognise four species of *Coptotermes* in Western Australia, *C. acinaciformis* (Frogg.), of which *C. raffrayi* Wasm. [*R.A.E.*, A **10** 630; **27** 546] is a subspecies, *C. michaelseni* Silv. [**10** 630], *C. frenchi* Hill [**27** 546; **35** 314], which is here recorded from the State for the first time, and a species recently described by Gay (1955) as *C. brunneus*, sp. n. Their distributions are shown on maps, and collection records given for the first three.

C. acinaciformis occurs in the south and west and is represented by subsp. *raffrayi* in the extreme south-west and by the typical subspecies and

intermediate forms in the other, drier parts of its range. It is the most abundant and destructive species in the south, occurs in regions with an annual rainfall ranging from 8 to 60 ins., and is common in built-up areas as well as in plant communities dominated by *Eucalyptus* spp., except those on deep sand; in the drier parts of the State, where *Acacia* is dominant, it is absent or rare, and the most destructive termite is *Rhinotermes* (*Schedorhinotermes*) *intermedius actuosus* Hill. Ten species of *Eucalyptus* that are attacked by *C. acinaciformis* when living and apparently sound and six that are in general resistant are listed. Dead wood is also attacked. Nests are made in living and dead trees throughout the area, but in the central-southern part of the State this termite and *C. frenchi*, which is common there, both construct symmetrical, domed mounds, though in different plant communities. Early-instar nymphs of the reproductives of both species were present in a few nests in the first week of February, and alates were observed in October–November. Flying alates of *C. acinaciformis* were collected in the vicinity of Perth in all months from October to the end of the year, but were most numerous in early November; those of *C. frenchi* were taken once, in December. This species occurs over the same general area as *C. acinaciformis*, except for the extreme south-west and the western coastal district. It usually feeds on small dead logs and sticks in contact with the ground, but was several times recorded attacking living trees. Its economic importance is unknown.

C. michaelseni, which is common in but confined to an area round Perth, has previously been confused with *C. frenchi*; characters differentiating the alate and soldier castes of the two are included. It appears to construct subterranean nests, and forms runways up dead trees and structural timbers, including *E. marginata*. Alates were observed in flight between 21st August and 8th November, but were numerous for only a few weeks.

C. brunneus is confined to a region north of the Murchison River and builds large symmetrical domed or conical mounds in *Eucalyptus*-dominated woodland and scrub. Alates were ready for dispersal in October, and colonising flights probably occur at the same time as those of *C. acinaciformis*.

Browne (L. B.). **The Effect of Light on the Fecundity of the Queensland Fruit-fly,** *Strumeta tryoni* **(Frogg.).**—*Aust. J. Zool.* **4** no. 2 pp. 125–145, 8 graphs, 13 refs. Melbourne, 1956.

The effect of light on mating and oviposition in *Dacus* (*Strumeta*) *tryoni* (Frogg.) was investigated in Australia in experiments in which newly emerged adults from a laboratory stock were exposed in transparent plastic cages of which one wall was replaced by a black organdie sleeve to the light from fluorescent lamps for 2, 4 or 7½ hours daily in a room in which natural light was admitted for only 40 minutes each day at dusk to induce pairing [*cf. R.A.E.*, A **42** 141]. A mixture of fruit paste and honey [**42** 140] was provided as food, in addition to dry sucrose and water, the experiments were carried out at 26·6°C. [79·9°F.] and about 75 per cent. relative humidity, and the intensities of illumination tested were 60, 120 and 240 lumens per sq. ft. for 7½ hours and 240 lm for 2 or 4 hours.

The following is based almost entirely on the author's summary of the results. The number of eggs laid was affected by both the intensity and the daily period of illumination. Newly emerged females kept with an equal number of males in constant darkness laid no eggs. When the daily period of illumination was 7½ hours, females laid fewer eggs at a light intensity of 120 lm per sq. ft. than at either 60 or 240, and when the light intensity was 240 lm per sq. ft., the number of eggs laid increased with the

daily period of illumination. These effects of light were exerted through its influence on the amount of feeding, the rate of egg maturation, the readiness with which eggs were laid, and the age at which the flies paired. Adults kept in constant darkness fed very little and did not mate; unmated females matured no eggs in darkness and mature, mated females transferred to it laid few. When the daily period of illumination was 7½ hours, the flies fed less and paired later and the females matured their eggs more slowly at 120 lm per sq. ft. than at 60 or 240 lm per sq. ft. The act of oviposition was not affected by light intensity. At 240 lm per sq. ft., the longer the daily period of illumination, the greater were the amount of feeding, the rate of egg maturation and the number of eggs laid by mature females, and the earlier pairing occurred.

It is probable that the effects of light on feeding and oviposition were due to its influence on the general activity of the flies, which were inactive in darkness and less active at 120 than at 60 or 240 lm per sq. ft. The effect of light on the rate of egg maturation can be explained by its effect on the amount of feeding.

Kelsey (J. M.). **Oviposition Preference by** *Costelytra zealandica* (**White**).—*N.Z. J. Sci. Tech.* **38** (A) no. 6 pp. 633–637, 2 refs. Wellington, N.Z., 1957.

The oviposition preferences of females of *Costelytra zealandica* (White) were investigated in New Zealand in 1951–52 in foot-square plots with various kinds of ground cover, the plots being separated from one another by concrete barriers, 6 ins. deep and flush with the soil surface, which had been shown to be effective in preventing movement of the larvae from one plot to another. Adults collected in November–December were distributed over the area, which was enclosed in a frame of wood and wire gauze, and the results were evaluated from counts of second-instar larvae in April. Significantly more larvae were found in plots with 10–100 per cent. pasture cover ranging in height up to 6 ins. (the highest tested) and in closely shaven plots, with or without additional straw cover, than in plots completely covered by growing rape or with no plant cover. The plots of rape, pasture plots from which the cover had been skimmed off, leaving only the roots, and bare ground covered with straw contained similar numbers of larvae, and pasture plots containing only roots, with no straw cover, highly significantly fewer, but still highly significantly more than soil that had been sieved to remove vegetable matter, in which very few eggs were laid but larval development was completed. Compacted and open soil were equally attractive. There were about twice as many larvae to the west of a line running north and south through the experimental area as to the east of it, and this is attributed to avoidance of moonlight by ovipositing females, which are negatively phototropic. It is concluded that ovipositing females will not leave an area until it is becoming depleted of vegetable matter both above and below ground, and the sudden disappearance of *C. zealandica* from pastures with good ground cover is attributed to the effects of attack by insect predators, milky disease and *Mermis* sp. [*cf. R.A.E.*, A **40** 205].

Kelsey (J. M.). **Insects attacking Tussock.**—*N.Z. J. Sci. Tech.* **38** (A) no. 6 pp. 638–643, 9 refs. Wellington, N.Z., 1957.

In this review of the insects that feed on native species of tussock-grass in New Zealand [*cf. R.A.E.*, A **29** 334], the author lists 27 species in five Orders observed feeding on the leaves and 19 in four Orders observed feeding on the roots of *Festuca novae-zelandiae*, *Poa caespitosa* or *P. colensoi*. The

information is based on observations over a period of ten years, during which no heavy infestations developed, and lists of insects recorded from tussock in the literature are included in an appendix. Lepidoptera, notably species of *Crambus*, *Persectania* and *Leucania*, were the most important on the leaves, though none was of much significance by itself, and Melolonthid larvae were sufficiently injurious to the roots in some places to enable grazing stock to pull up the plants. Among the latter, *Costelytra zealandica* (White) was the most injurious. The leaf-eating species are considered beneficial, since the centre of tussock-grass plants tends to die out and the accumulated insect frass, with its associated moulds, hastens the process of decay, as a result of which an excellent medium is provided in a protected site for the germination of seeds from the parent plant. The root-feeding insects caused a definite reduction in plant vigour.

Kelsey (J. M.). **Virus Sprays for Control of *Pieris rapae* L.**—*N.Z. J. Sci. Tech.* **38** (A) no. 6 pp. 644–646, 6 refs. Wellington, N.Z., 1957.

A virus disease that caused high mortality of larvae of *Pieris rapae* (L.) was observed at Ashburton, New Zealand, in 1947–48, and preliminary tests were carried out to determine the value of sprays prepared from infested larvae. The sprays were made by grinding up 2–10 larvae that had recently died, and were in the fluid stage, in 2 fl. oz. water, filtering through muslin and diluting the filtrate in 1–8 pints water, and they were applied within half an hour of preparation to the upper surfaces of the leaves of cabbage plants, on each of which latter six apparently healthy larvae were feeding. No symptoms were observed after two days, but almost all the larvae on all the sprayed plants were dead and showing symptoms of the disease after 12, whereas only one of 36 was infected on the control plants at the end of the plot. In another test, in which the sprays were not applied until 6½ hours after preparation and larvae were placed on the sprayed plants, none became infected.

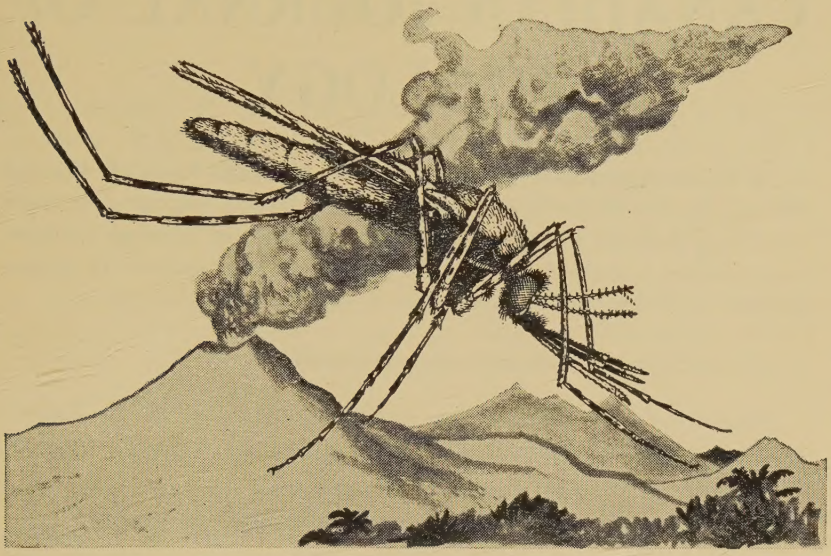
In a test to determine whether the disease could be transmitted by ovipositing parasites, all of ten larvae pierced with an infected hypodermic needle, but only one of ten pierced with an infected solid needle and none of two other batches pierced with sterile instruments, developed the disease. The virus might thus be transmitted in this way, if parasites oviposit in infected larvae.

Papers noticed by Title only.

Kennedy (J. S.). **Phase Transformation in Locust Biology** [a review article].—*Biol. Rev.* **31** pp. 349–370, 75 refs. Cambridge, 1956.

Bugdanov (G. B.). **A Russian Bibliography of Locusts and Grasshoppers.** [*In Russian.*]—67 pp. Ordzhonikidze, Severo-Osetinsk. sel'skokhoz. Inst., Minist. Sel'sk. Khoz. SSSR, 1958.

Zimmerman (E. C.). **Insects of Hawaii. A Manual of the Insects of the Hawaiian Islands, including an Enumeration of the Species and Notes on their Origin, Distribution, Hosts, Parasites, etc. Volume 6. Ephemeroptera-Neuroptera-Trichoptera and Supplement to Volumes 1 to 5.**—ix [+1+] 209 pp., 105 figs., refs. Honolulu, Univ. Hawaii Press, 1957. Price $4.50. [*Cf. R.A.E.*, A **37** 361.]



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